User Manual
Engine Safety Alarm Panel

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4.1 List of Items

1. General Information

1.1 Illustration

This manual is intended for use by field engineering, installation, operation, and repair personnel. Every effort has been made to ensure the accuracy of the information contained herein. RAJKOT MARINE will not be held liable for errors in this material, or for consequences arising from misuse of this material.

1.2 <u>Safety Requirements</u>

Personnel Training

All personnel performing installation, operations, repair, or maintenance procedures on the equipment, or   those in the vicinity of the equipment, should be trained on ship safety, tool operation, and maintenance to ensure their safety. Personnel should wear protective gear during installation, maintenance, and certain operations.

1.3 <u>General System Safety Practices</u>

The equipment discussed in this manual may require or contain one or more utilities, such as electrical, hydraulic, pneumatic, or cooling water.

➢ Isolate energy sources before beginning work.

➢ Avoid performing maintenance or repairs while the equipment is in operation.

➢ Wear proper protective equipment during equipment installation, maintenance, or repair.

1.4 <u>Replacing Components</u>

➢ Verify that all components (such as cables, hoses, etc.) are tagged and labeled during assembly and disassembly of equipment to ensure correct installment.

➢ Replace failed or damaged components with parts mentioned in component list. Failure to do so could result in equipment damage or injury to personnel.

1.5 <u>Routine Maintenance</u>

Equipment must be maintained on a routine basis. Failure to conduct routine maintenance could result in equipment damage or injury to personnel.

2. General Safety Precautions

2.1 <u>Electric Circuit Safety Precautions</u>

Certain safety precautions must be exercised regarding the electric circuits of the control system. These precautions will prevent damage to equipment and injury to personnel.

➢ Personnel engaged in electrical work should receive proper instruction in accident prevention and first aid procedures.

➢ An electric source power must be supplied at correct voltage, current, and phase to enable safe and correct operation of equipment.

Exercise caution when working around exposed electrical conductors, terminals, and remotely activated equipment. Avoid damage to the mating surfaces (flame path) of explosion-proof Electrical junction boxes and the associated covers,

➢ Connections and circuit breakers. This will prevent fires or explosion that might result from a spark during electrical switching.

➢ Do not override or tamper with electrical or mechanical interlocks and safety devices. Before attempting any corrective action on the electrical circuit, verify that all electric power sources have been removed from the circuit. Ensure that all electrical switches are set to 'Off' and the appropriate breakers are set to 'Open'.

➢ Do not service or adjust the electrical circuits alone. Always verify that a qualified person is present who can render aid in case of accident and who is familiar with emergency shutdown procedures.

➢ Appropriate warning tags labeled 'Requiring Open Circuit Condition' shall be placed on all necessary switches and circuit breakers to prevent accidental application of power to units of the system during maintenance procedures.

➢ Wear suitable protective clothing while working within 4 feet of exposed electrical equipment. Do not wear rings, wristwatches, or clothing with exposed metal buttons, zippers, or fasteners.

➢ Metal handles of hand-held tools should be insulated by an approved taping, coating, or sleeve method. Whenever it is necessary to work on electrical circuits or equipment in wet or damp locations, dry, wooden (or similar non conducting material) platforms should be provided to prevent the possibility of contact between the wet floor and the workman's shoes.

2.2 <u>Cable and Hoses Safety Precautions</u>

Protect all hydraulic hoses from cutting, scraping, pinching, abrasion, or any physical damage. Route all cables and hoses outside of the crew's traffic patterns and away from mechanical equipment. Welding or acetylene cutting must not be done near unprotected cables or hoses, as this may result in damage to cables or hoses. Consideration must always be given to the prescribed minimum bend radius for cables and hoses. Twisting or bending cables or hoses beyond the minimum bend radius can damage the insulation, conductors, or reinforcing wire shield.

2.3 <u>Work Area Safety Precautions</u>

Work in an area free of any dangerous obstructions, chemicals, or hazards. If any dangerous obstruction is located overhead, to the side, or on the surrounding floor of the work area, the hazard must be removed as safely and quickly as possible by appropriate personnel. If any flammable materials are located in or are spilled within or in proximity to the work area, the hazardous materials must be removed and cleaned from the work area. Flammable materials include but are not limited to the following materials:

➢ Oily rags, paper products, or any combustible solid

➢ Kerosene, gasoline or any combustible liquid

➢ Oxygen tanks, acetylene tanks, or any combustible gas

Should any condition, situation, or circumstance occur that might pose serious hazard(s), appropriate action must be taken to correct or remove the hazard(s) from the work area.

3. System description

3.1 Engine Alarm Monitoring System

Features:

1. Monitor engine parameters and alarms locally and remotely.
2. Start/Stop engine locally and from remote (From wheel house).
3. Engine parameters and alarm logging into USB (From engine room panel).
4. Password protected service reminder settings.
5. Day/night color changing through key.
6. Easily programmable using USB stick.
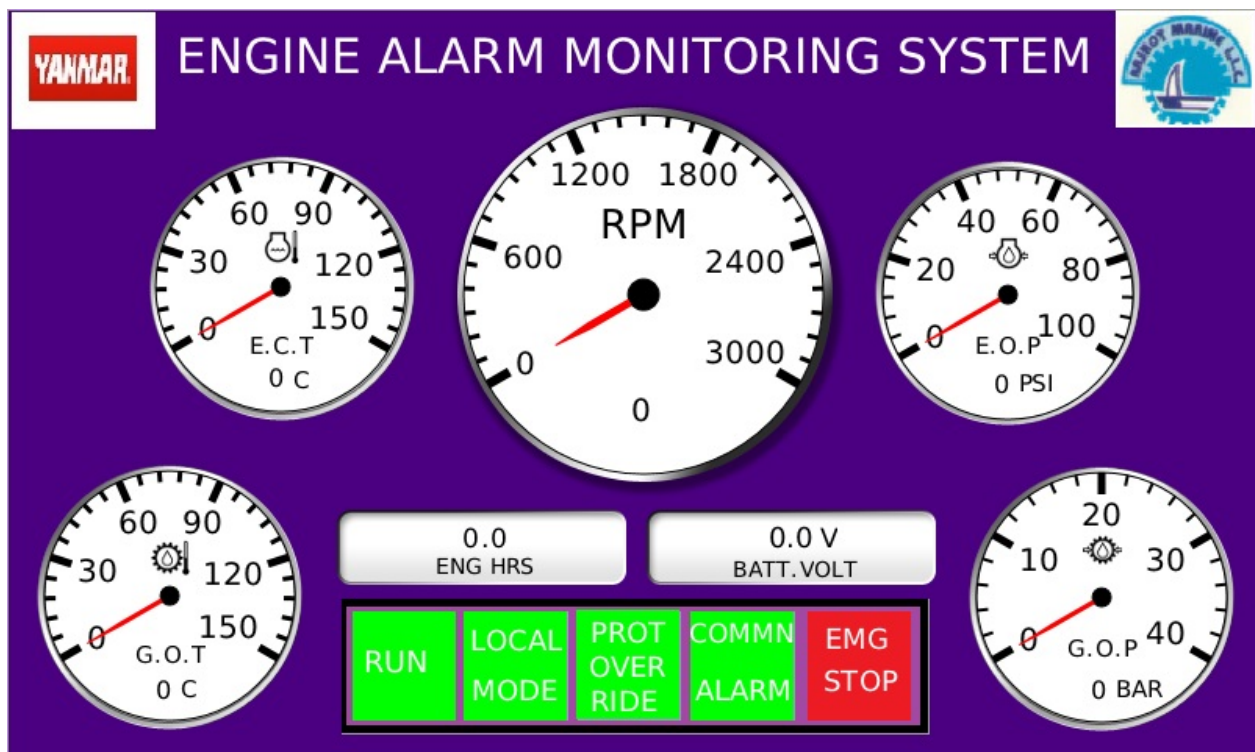
3.2 Block Diagram Representation: Engine AMS

YANMAR ENGINE

ENGINE MOUNTED GAUGE PANEL PLATE

ANALOG SENSOR
1. ENGINE OIL TEMPERATURE
2. SEA WATER PRESSURE
3. GEAR OIL TEMPERATURE
4. GEAR OIL CLUTCHED PRESSURE
5. COOLANT PRESSURE

RESISTIVE SENSOR
1. ENGINE OIL PRESSURE
2. COOLANT TEMPERATURE

DIGITAL SENSOR
1. ENGINE OIL PRESSURE
2. COOLANT TEMPERATURE
3. ENGINE OIL FILTER DIFFERENTIAL PRESSURE
4. COOLANT LEVEL

ADDITIONAL SENSOR
1. MPU
2. EXHAUST

MECAHNICAL GAUGES
OPTIONAL GAUGES

LOCAL PANEL
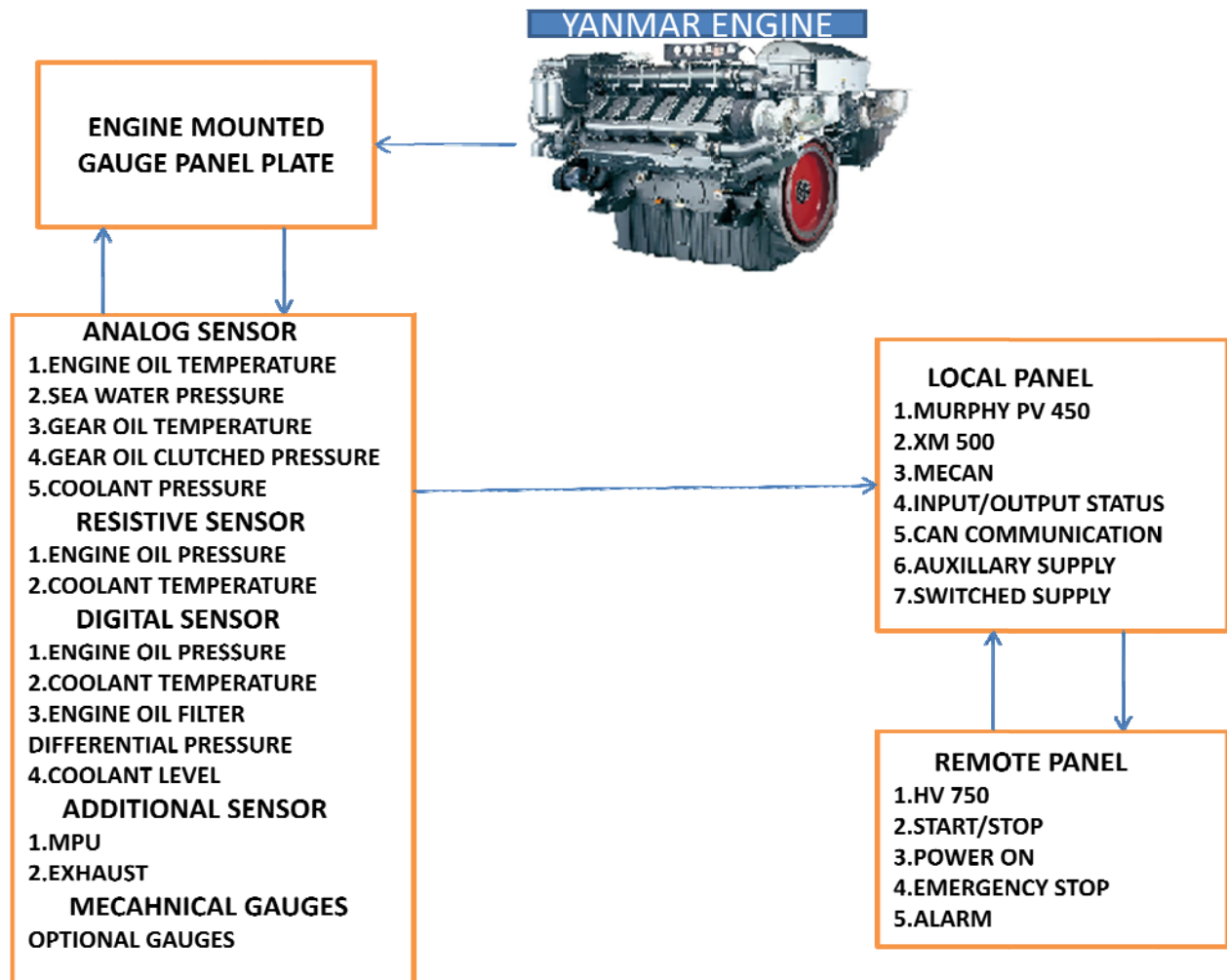1. MURPHY PV 450
2. XM 500
3. MECAN
4. INPUT/OUTPUT STATUS
5. CAN COMMUNICATION
6. AUXILLARY SUPPLY
7. SWITCHED SUPPLY

REMOTE PANEL
1. HV 750
2. START/STOP
3. POWER ON
4. EMERGENCY STOP
5. ALARM

3.3 <u>Block diagram description:</u>

Above figure shows block diagram representation of engine control panel system. This system is designed for controlling and monitoring engine system. Also it will display all important engine data (oil pressure, coolant temperature, speed, etc), safety alarms and emergency indication in wheel house as well as in engine room. This system uses Murphy's **HV750** as a monitoring cum controlling device which is very user friendly.

3.4 Local Panel

Local panel serves the purpose of controlling and monitoring of engine necessary data parameters. It incorporates engine start/stop and emergency stop in local (engine room) as well as in remote (wheel house). Also it will shutdown engine when it will detect any safety alarm (engine oil pressure low, coolant temperature high, engine over speed, etc). Panel uses CAN open communication protocol for transmitting engine data to local and remote panel display units. Communication process will be explained in detail in communication chapter.

Engine room panel

3.4.1 <u>Functions:</u>

1. Engine start/stop and emergency stop

   - Engine start/stop from local panel will be in action only when Local/Remote selector switch is in "Local" position.
   - Green color PB mounted on front door of panel serves engine start function. Red color PB mounted on front door of panel serves engine stop function. (Engine can be stopped anytime from local or remote irrespective of Local/Remote selector switch position.
   - During stop mode, stop relay will remain ON until engine speed drops below 100 rpm. Stop relay is resetted with XM500 DOUT1. DOUT 1 is turned on through J1939 network by HV750 whenever engine rpm drops below 100 rpm

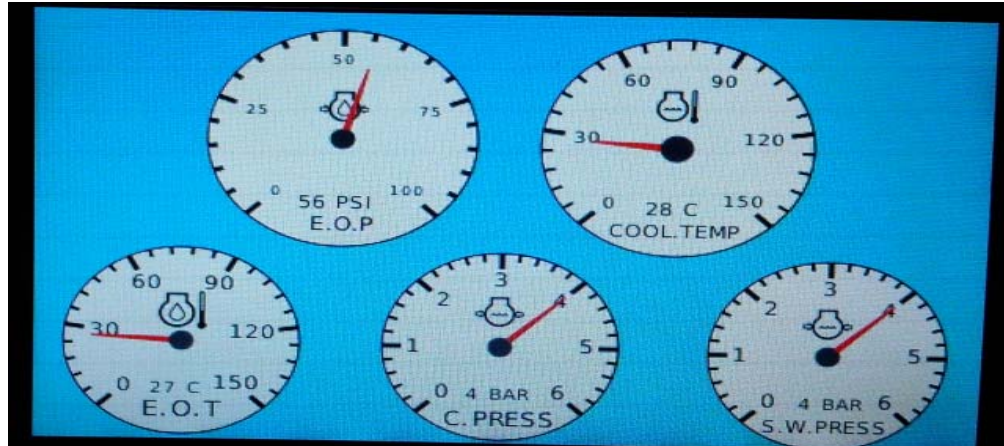- Engine can be stopped in emergency through anyone of the emergency stop PBs in local or remote panel.

2. Engine parameter monitoring

   All the engine parameters are monitored by PV450 throughX500.

   Following is the list of engine parameters which are monitored in local   panel
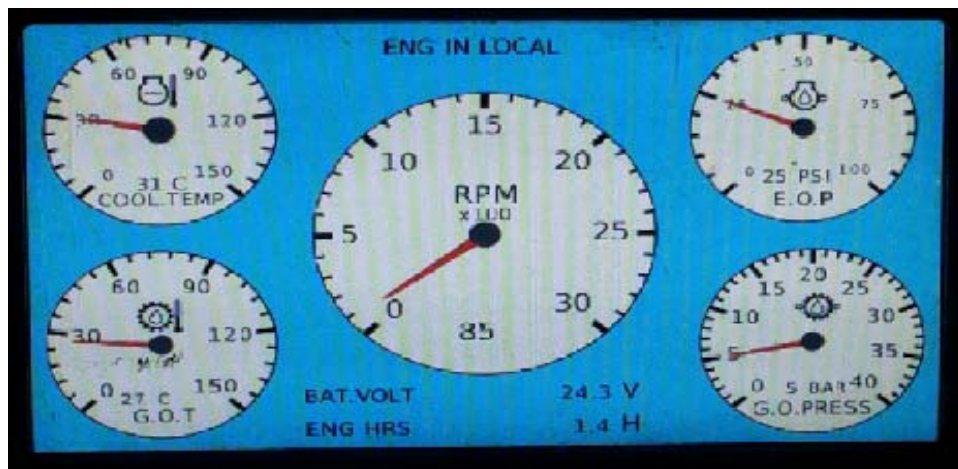
1st *Screen display in Local panel (PV450)*

2ⁿᵈ *Screen display in Local panel (PV450)*

- Engine speed in RPM. (Range 0---3000 rpm)
- Engine oil pressure in PSI. (Range 0---100 psi)
- Engine coolant temperature in degree Celsius. (Range 0---150C)
- Engine oil temperature in degree Celsius. (Range 0---150C)
- Sea water pressure in BAR. (Range 0---6 bar)
- Engine coolant pressure in BAR. (Range 0---6 bar)
- Gear oil pressure in BAR. (Range 0---40 bar)

- Gear oil temperature in degree Celsius. (Range 0---150 C)
- Battery supply voltage in VOLTS. (Range 18---32VDC).
- Engine running hours.

3. Warning and shutdown alarm monitoring

- Main Power Fail.
  System will give this alarm whenever main power is cut-off.

- Backup Power Fail.
  System will give this alarm whenever backup power is cut-off.

- Emergency Shutdown.
  System will give this alarm whenever emergency push button is pressed from local or remote panel and then after will shut down engine.

- Engine Over speed Shutdown.
  System will give this alarm whenever engine speed is above 3500rpm. Simultaneously it will shutdown engine for safety reason.

- Engine Oil Pressure Low Shutdown.
  System will give this alarm whenever engine oil pressure drops below 10psi while engine is running (i.e. when engine speed > 600rpm) and simultaneously it will shutdown engine for safety reason.

.
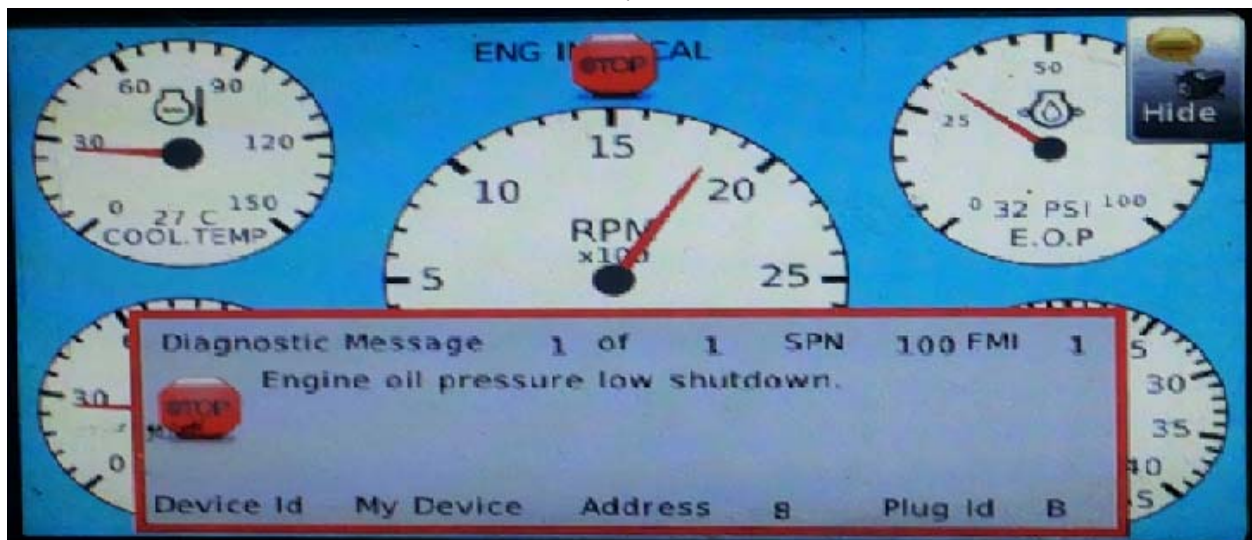
Engine oil pressure shutdown indication in PV 450

- Engine Coolant Temperature High Shutdown.
  System will give this alarm whenever engine coolant temperature rises above 110C while engine is running (i.e. when engine speed > 600rpm) and simultaneously it will shutdown engine for safety reason.
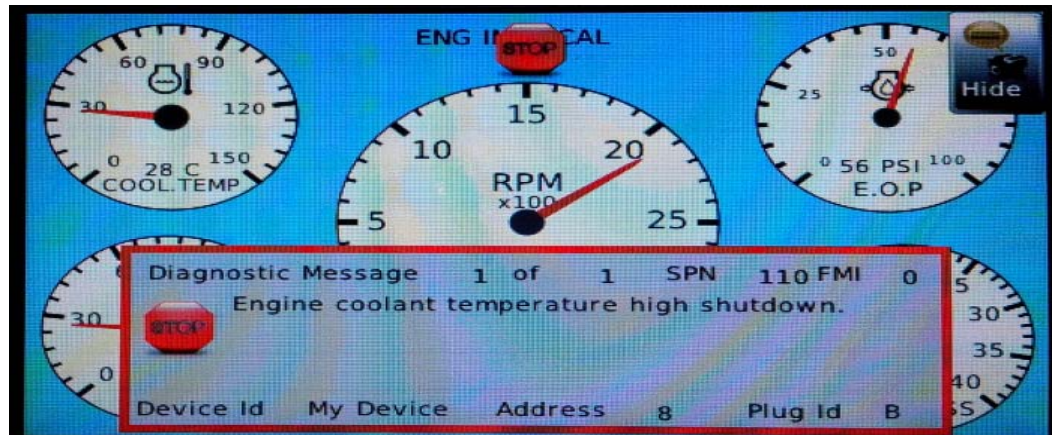
Engine coolant temperature high Shutdown in PV 450

- Engine Oil Pressure Low Warning.
  System will give this alarm whenever engine oil pressure drops below 20psi while engine is running (i.e. when engine speed > 600rpm) .

- Engine Coolant Temperature High Warning.
  System will give this alarm whenever engine coolant temperature rises above 100C while engine is running (i.e. when engine speed > 600rpm) .

- Protection Override.
  System will give this alarm whenever protection override toggle switch is turn ON either from local or from remote panel.

- Engine Coolant Level Low Warning.
  System will give this alarm when engine mounted coolant level switch gives level low signal while engine is running (i.e. when engine speed > 600rpm) .

- Engine Oil Differential Pressure High Warning.
  System will give this alarm when engine oil differential pressure switch gauge mounted on gauge plate gives differential pressure high signal while engine is running (i.e. when engine speed > 600rpm) .

- Engine Oil Temperature High Warning.
  System will give this alarm when engine oil temperature rises above 105C (set point is configured in XM500 which is reading eng oil temp from analog

transmitter mounted on gauge plate) while engine is running (i.e. when engine speed > 600rpm) .

- Engine Coolant Pressure Low Warning.
  System will give this alarm when sea water pressure drops below 0.2bar (set point is configured in XM500 which is reading sea water pressure from analog transmitter mounted on gauge plate) while engine is running (i.e. when engine speed > 600rpm) .

- Seawater Pressure Low Warning.
  System will give this alarm when engine coolant pressure drops below 0.2bar (set point is configured in XM500 which is reading eng coolant pressure from analog transmitter mounted on gauge plate) while engine is running (i.e. when engine speed > 600 rpm) .

- Gear Oil Clutched Pressure Low Warning.
  System will give this alarm when gear oil clutched pressure switch gauge on engine mounted gauge plate gives pressure low signal while engine is running (i.e. when engine speed > 600rpm) and gear is clutched IN.

- Gear Oil Temperature High Warning.
  System will give this alarm when gear oil temperature rises above 105C (set point is configured in XM500 which is reading gear oil temp from analog transmitter mounted on gauge plate) while engine is running (i.e. when engine speed > 600 rpm) .

4. Buzzer:
   Whenever there is warning or shutdown alarm in system buzzer will turn ON. XM500 DOUT2 turns ON buzzer which in turn is turned ON by HV750 through J1939 network. To silent buzzer there is black color PB mounted on front door of local panel.

5. Data Logging:
   All the above engine parameters and alarms can be logged into USB from local panel. For this one has to open local panel and plug USB stick into USB cable connected to PV450 display unit.

3.4.2 <u>Working Description:</u>

Local panel consist of four major components viz., MeCAN 1, MeCAN 2, XM500 and PV450. These components read engine parameter from engine mounted gauge plate (details of gauge plate will be covered later in this manual) and display on PV450.

1. MeCAN 1: (J1939 address = 8)

    MeCAN is a convertor that converts resistive/ switch input to CAN data. Engine oil pressure low, coolant temperature high and over speed shutdown is through MeCAN 1. MeCAN 1 reads E.O.P.L and E.C.T.H shutdown signals from switches mounted on engine gauge plate. MeCAN 1 provides these signals to PV450 in local panel and HV750 in remote p-panel for monitoring of shutdown alarms. Signals are exchanged through J1939 communication protocol.

2. MeCAN 2: (J1939 address = 7)

    MeCAN 2 reads engine oil pressure, coolant temperature and speed from engine mounted resistive senders and MPU (Magnetic Pick Up) sensor. Beside these parameters it also provides battery voltage, engine running hours and warning signals for E.O.P.L and E.C.T.H. Warning signal is triggered when engine speed is above 600rpm. MeCAN 1 provides these signals to PV450 in local panel and HV750 in remote p-panel for monitoring of shutdown alarms. Signals are exchanged through J1939 communication protocol.

    MeCANs are preprogrammed from factory and cannot be reprogrammed.

    Detail explanation for MeCAN is covered under MeCAN section which will come later in this manual.

3. XM500: (J1939 address = 6)

    XM500 reads engine oil temperature, sea water pressure, coolant pressure, gear oil temperature, engine coolant level low, engine oil differential pressure high, gear oil clutched pressure low from transmitters and switches mounted on engine mounted gauge plate. It provides all data to PV450 and HV750 display unit through J1939.

    Programming XM500 requires "**XM500 Config**" programming software along with cable accessories.

    Details for XM500 and procedure for programming is covered under XM500 section later in this manual.

4. PV450: (J1939 address = 242)

    PV450 is a display unit used for monitoring engine parameters, warning and alarms. It reads data to be monitored from MeCANs and XM500 through J1939 network. Also it communicates with HV750 in remote panel through J1939 network.

It displays engine parameters in colorful gauge format and in text gauge format as well so as to make monitoring clear and easy for analysis.

It provides "**data logging into USB**" screen for logging all engine parameters and alarms into USB stick anytime.

Details for PV450 and procedure for programming is covered under PV450 section later in this manual.

3.5 Remote Panel

Remote panel serves the purpose of controlling and monitoring of engine necessary data parameters. It incorporates engine start/stop and emergency stop in remote (wheel house). Also it will shutdown engine when it will detect any safety alarm (engine oil pressure low, coolant temperature high, engine over speed, etc). Panel uses CAN open communication protocol for transmitting engine data to local and remote panel display units. Communication process will be explained in detail in communication chapter.


Remote panel in wheel house

3.5.1 Functions

1 Engine start/stop and emergency stop

- Engine start/stop from remote panel will be in action only when Local/Remote selector switch is in "Remote" position.

- Green color PB mounted on front door of panel serves engine start function. Red color PB mounted on front door of panel serves engine stop function. (Engine can be stopped anytime from local or remote irrespective of Local/Remote selector switch position).
- Engine can be stopped in emergency through anyone of the emergency stop PBs in local or remote panel.

2. Engine parameter monitoring

All the engine parameters are monitored by HV450 throughX500.Following is the list of engine parameters which are monitored in   local   panel
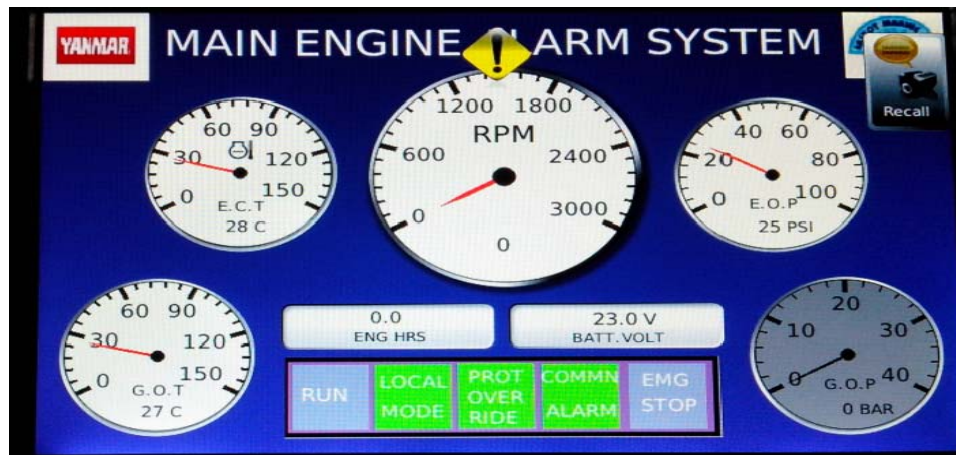
1st Screen display in wheelhouse (HV750)

2nd Screen display in wheelhouse (HV750)

- Engine speed in RPM. (Range 0---3000 rpm)
- Engine oil pressure in PSI. (Range 0---100 psi)
- Engine coolant temperature in degree Celsius. (Range 0---150C)

- Engine oil temperature in degree Celsius. (Range 0---150C)
- Sea water pressure in BAR. (Range 0---6 bar)
- Engine coolant pressure in BAR. (Range 0---6 bar)
- Gear oil pressure in BAR. (Range 0---40 bar)
- Gear oil temperature in degree Celsius. (Range 0---150 C)
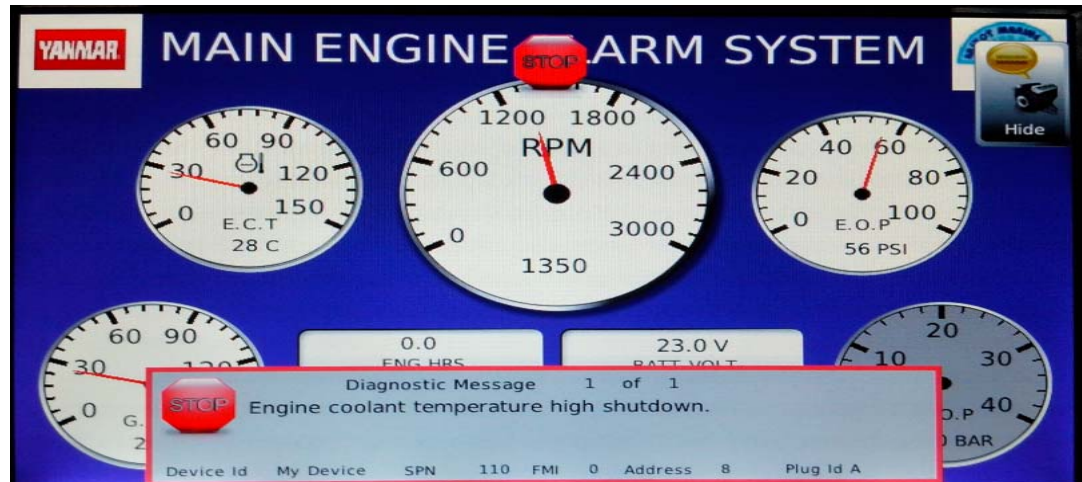- Battery supply voltage in VOLTS. (Range 18---32VDC).
- Engine running hours.
-

3. Warning and shutdown alarm monitoring

- Main Power Fail.
  System will give this alarm whenever main power is cut-off.

- Backup Power Fail.
  System will give this alarm whenever backup power is cut-off.

- Emergency Shutdown .
  System will give this alarm whenever emg push button is pressed from local or remote panel and then after will shut down engine.

- Engine Over speed Shutdown.
  System will give this alarm whenever engine speed is above 3500rpm. Simultaneously it will shutdown engine for safety reason.

- Engine Oil Pressure Low Shutdown.
  System will give this alarm whenever engine oil pressure drops below 10psi while engine is running (i.e. when engine speed > 600 rpm) and simultaneously it will shutdown engine for safety reason.

- Engine Coolant Temperature High Shutdown.
  System will give this alarm whenever engine coolant temperature rises above 110C while engine is running (i.e. when engine speed > 600 rpm) and simultaneously it will shutdown engine for safety reason.

Engine coolant temperature high Shutdown in HV 750

- Engine Oil Pressure Low Warning.
  System will give this alarm whenever engine oil pressure drops below 20psi while engine is running (i.e. when engine speed > 600 rpm) .

- Engine Coolant Temperature High Warning.
  System will give this alarm whenever engine coolant temperature rises above 100C while engine is running (i.e. when engine speed > 600rpm) .

- Protection Override.
  System will give this alarm whenever protection override toggle switch is turn ON either from local or from remote panel.

- Engine Coolant Level Low Warning.
  System will give this alarm when engine mounted coolant level switch gives level low signal while engine is running (i.e. when engine speed > 600rpm) .

- Engine Oil Differential Pressure High Warning.
  System will give this alarm when engine oil differential pressure switch gauge mounted on gauge plate gives differential pressure high signal while engine is running (i.e. when engine speed > 600rpm) .

- Engine Oil Temperature High Warning.
  System will give this alarm when engine oil temperature rises above 105C (set point is configured in XM500 which is reading eng oil temp from analog transmitter mounted on gauge plate) while engine is running (i.e. when engine speed > 600rpm) .

- Engine Coolant Pressure Low Warning.
  System will give this alarm when sea water pressure drops below 0.2bar (set point is configured in XM500 which is reading sea water pressure from analog transmitter mounted on gauge plate) while engine is running (i.e. when engine speed > 600rpm) .

- Seawater Pressure Low Warning.
  System will give this alarm when engine coolant pressure drops below 0.2bar (set point is configured in XM500 which is reading eng coolant pressure from analog transmitter mounted on gauge plate) while engine is running (i.e. when engine speed > 600rpm) .

- Gear Oil Clutched Pressure Low Warning.
  System will give this alarm when gear oil clutched pressure switch gauge on engine mounted gauge plate gives pressure low signal while engine is running (i.e. when engine speed > 600rpm) and gear is clutched IN.

- Gear Oil Temperature High Warning.
  System will give this alarm when gear oil temperature rises above 105C (set point is configured in XM500 which is reading gear oil temp from analog transmitter mounted on gauge plate) while engine is running (i.e. when engine speed > 600rpm) .

4. Buzzer:
   Whenever there is warning or shutdown alarm in system buzzer will turn ON. XM500 DOUT2 turns ON buzzer which in turn is turned ON by HV750 through J1939 network. To silent buzzer there is key on HV750 with name " Hide". This screen will appear whenever there is an alarm detected in system.

5. Day/ Night Color Change:
   Day/ night color change is very much required in **Marine** application where light intensity need to be reduced during night time using **dimmer switch.** In this system this can be done just pressing one of the functional key of HV750. This key will function like a toggle switch for day and night color change.

Day Mode: Press top most function key on right hand of night mode screen
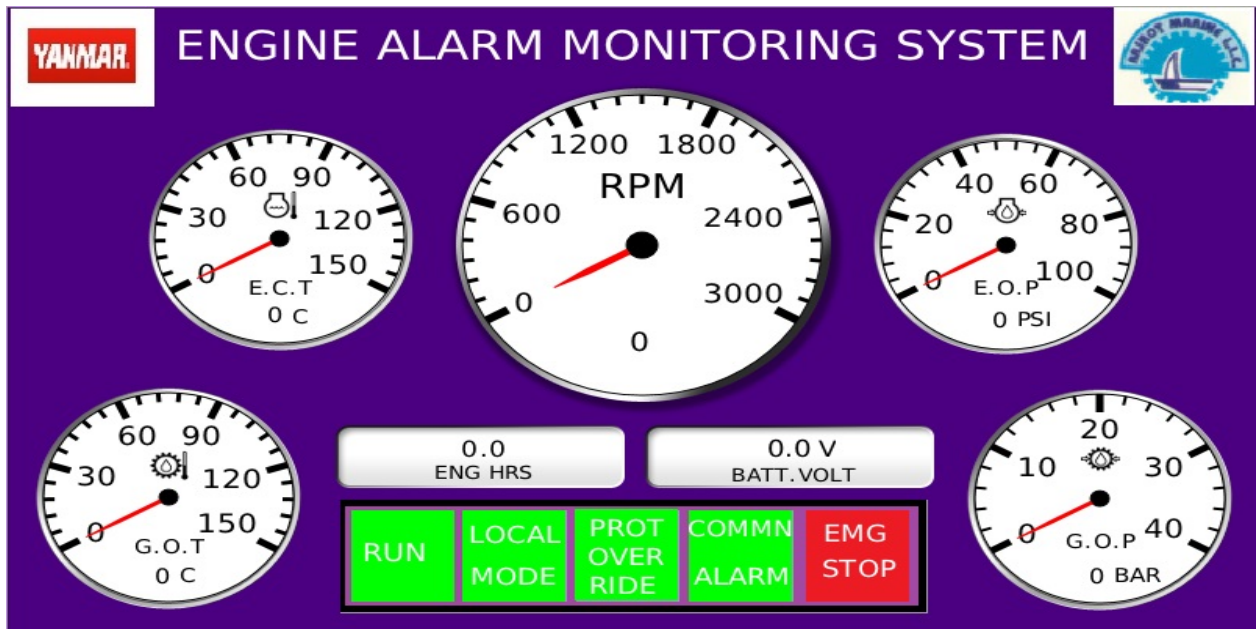
Remote panel startup screen in day mode.

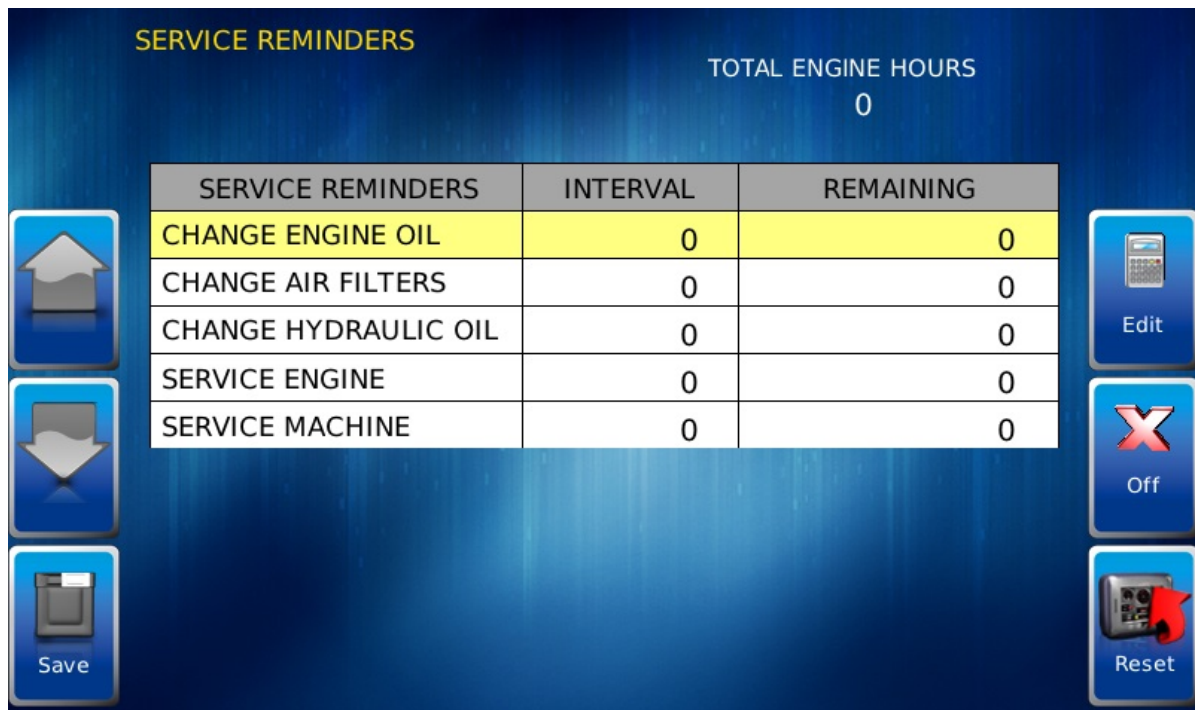**Night Mode: Press top most function key on right hand of above screen**
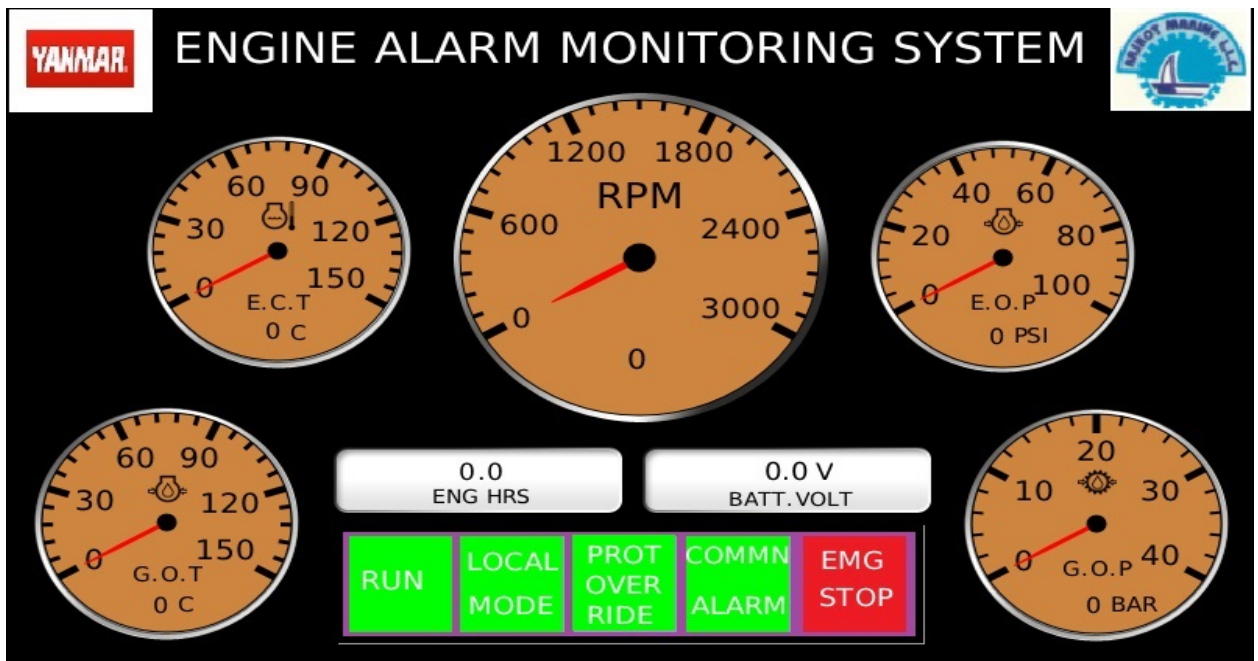
Remote panel startup screen in night mode.

6. Service Reminder Settings:
   Service reminder settings can be done in HV750. Total five service reminder are provided, those are.,
   i.   Change engine oil.
   ii.   Change air filter.
   iii.   Change hydraulic oil.
   iv.   Service engine.
   v.   Service machine.

   Only authorize person will be allowed to change the settings because there is   password protection for making any changes in settings.

7. Engine Control Status:

This screen shows important engine data which need to be monitored before starting, while running and during engine shutdown conditions. It is present only in start up screen of HV750 display unit.

i. RUN:
This shows engine run and stop status. Status turns **green** whenever engine is running at speed above 500rpm. Other when engine is stopped (speed below 100rpm) status is **gray.**

ii. LOCAL MODE:
This shows engine control mode. When engine control is set to local from local panel then status will turn **green** otherwise it turn **gray** showing that engine control is set to remote from local panel.

iii. PROT OVERRIDE:
This shows status of protection override toggle switch in local as well remote panel. Whenever toggle switch is set in then the status will turn **green** otherwise it remains **gray** showing that toggle switch is in OFF position.

iv. COMMON ALARM:
This shows presence of any warning or shutdown alarm in engine AMS. It will turn **green** whenever there is any alarm active in system otherwise it will turn **gray** indicating that there is no alarm present in system.

v. EMG STOP:
This shows status of emergency PB in local as well remote panel. Whenever EMG PB is pressed irrespective of engine control mode it will turn **green** otherwise it turns **gray** indicating healthy state of EMG PBs.

3.5.2 <u>Working Description:</u>

Remote panel consist of HV750 display unit, key switch, stop PB, EMG PB and a buzzer. Here main component is HV750 and also it is master on entire engine AMS. HV750 is controlling J1939 data communication within the network.

1. HV750: (J1939 address = 127, CAN PORT 1)
   HV50 is a display unit used for monitoring engine parameters, warning and alarms. It reads data to be monitored from MeCANs and XM500 through J1939 network. Also it communicates with PV750 in local panel through J1939 network.

   It displays engine parameters in colorful gauge format and in text gauge format as well so as to make monitoring clear and easy for analysis.

   It allows user to set service reminder for engine parameters. Also, only authorize person is allowed to make changes in service reminder settings due to password protection.

   Day and night mode color changing option is provided through one of the functional key.

Details for HV750 and procedure for programming is covered under HV750 section later in this manual.

3.6 Engine Mounted Gauge Panel Plate

Engine mounting Plate

This panel is present in the Engine side. The gauge plate consist of Gauges, Transmitters, and the control Switches. Here two Gauges are present one for the Engine oil differential pressure which is an switched gauge and other for the Gear oil pressure. The transmitters are used for Coolant pressure, Sea water pressure and Gear oil clutched pressure. The two control switches are also present that will used for the controlling of Engine oil pressure and Coolant Temperature. The all the connections are going to the JB which present in the Gauge plate. The functions of gauges which is used for the showing the Values respected pressure and controlling. The transmitter which we used will converts the physical value to amps rating(4-20ma).The main function of the Control switch which will having the specific set points pressure and temperature when the value will reached the set point it will give the status to the respective system.

3.6.1 Analog Transmitters

Analog transmitter

The Analog transmitter converts physical quantity into 4—20mA signal. It can be pressure transmitters, temperature transmitters, etc.

1. **Engine Oil temperature:** (Temperature transmitter)

   Input   : 4----20mA
   Output: 0----150C

2. **Sea water Pressure:** (Pressure transmitter)

   Input   : 4----20mA
   Output: 0----6bar

3. **Gear Oil Temperature:** (Temperature transmitter)

   Input   : 4----20mA
   Output: 0----40bar

4. **Coolant pressure:** (Pressure transmitter)

   Input   : 4----20mA
   Output: 0----6bar

3.6.2 Resistive Senders

Pressure type resistive sender   *Temperature type resistive sender*

The resistive sensors are the sensors which will convert the physical Quantities such as pressure, temperature etc to resistance. Here we are using pressure sender and temperature sender for monitoring engine oil pressure and coolant temperature.

1. Engine oil pressure

For the detection of Engine oil pressure we are using pressure sensors. the sensor having the range of 0-100psi.Which will convert the physical unit to resistance for the detection of the status. Here when the pressure will increase then the resistance will be decrease as per this status we will find the actually value of the pressure

2. Coolant temperature

For the detection of Coolant temperature we are using temperature sensor having the range of 0-120C ,which will convert temperature physical unit to resistance .Here also when the temperature increases then the resistance will decrease and by this we will get the actually value of Temperature.

3.6.3 Digital Sensor

Pressure control switch KPS-31   *Temperature control switch KPS 80*

The Digital sensors are the sensors which will convert the Analog signal to digital signals. These types of sensors are mainly used for switched application. In this we are using this sensors for finding the below status.

1. Engine Oil pressure
2. Coolant Temperature
3. Engine oil filter differential pressure
4. Coolant level

1. **Engine oil pressure low**

Engine oil pressure switch is mounted on gauge plate. Whenever engine oil pressure is below set point it will give signal to local panel. NO contact of switch is used for this signal.

2. **Coolant temperature high**

Engine coolant temperature switch is mounted on gauge plate. Whenever engine coolant temperature is above set point it will give signal to local panel. NO contact of switch is used for this signal.

3. Engine oil filter differential pressure high

Engine oil filter differential pressure high signal is taken from switch gauge mounted on gauge plate. Whenever engine oil differential pressure is above set point switch gauge contact will give signal to local panel. NO contact is used for this signal.

4. Coolant level low

This signal is provided by coolant level switch mounted on engine coolant tank. Switch will give a signal whenever coolant level is below its set point. NO contact is used for this signal.

3.7 Additional sensors

1. MPU: Magnetic Pick Up
   M PU is used for monitoring engine speed. It takes engine rotation as an input and gives PWM output as output to local panel. Further in local panel it goes to two MeCANs for monitoring and shutdown purpose.

2. Thermocouple: (Optional)
   This sensor can be used for monitoring engine exhaust cylinder temperature. This can be connected to XM500 thermocouple input. Drawing must be referred before connecting so as to avoid any damage to XM500.

3.8 MeCAN
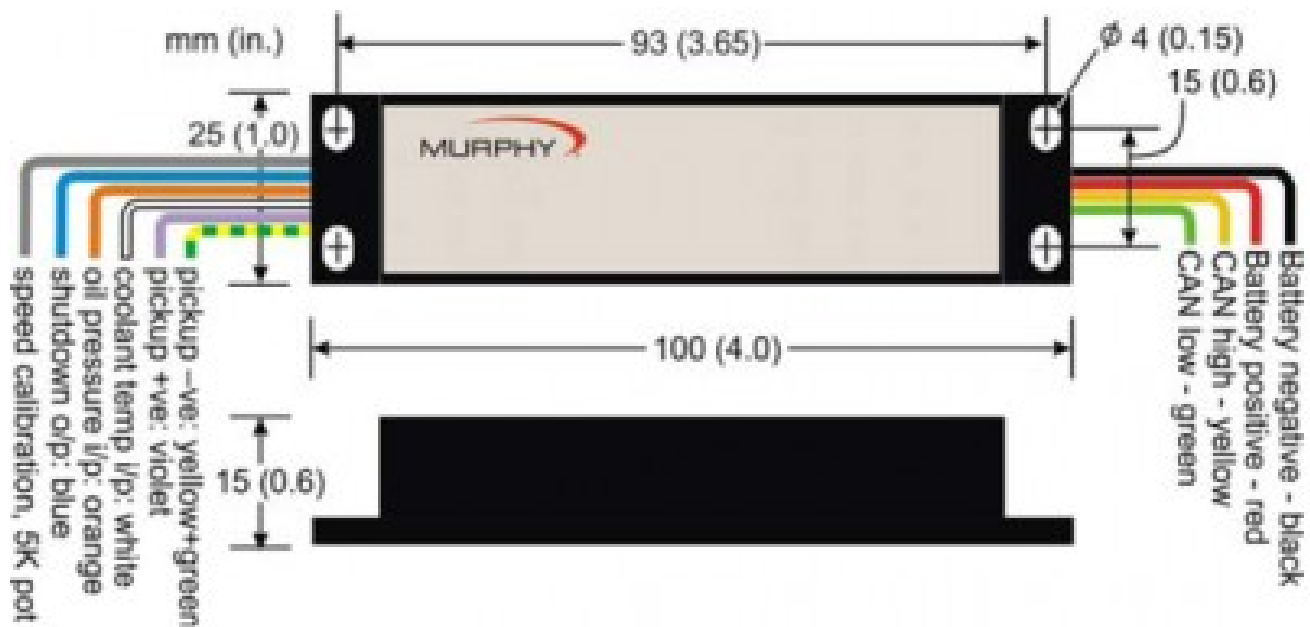
MeCAN is a compact, encapsulated interface module that translates resistive sender, fault switch and speed signals into SAE J1939 CAN bus data. MeCAN allows quick and simple integration of 'mechanical', non-ECU engines into modern CAN bus systems.

MeCAN has three sensor inputs and one output. Two inputs are for oil pressure and coolant temperature sensing, either by fault switches or resistive senders. The third input measures engine speed, using MPU or charge alternator signal. Input signals are translated into SAE J1939 CAN bus messages with appropriate PGN address, data scaling and transmission rate. The 'shutdown' output operates and latches if the pressure, temperature or speed inputs deviate outside preset fault limits.

A fourth input is connected and light enough for inclusion in many wiring harness, but can also be surface mounted via four fixing holes. The case is fully sealed in epoxy resin for high impact and environmental resistance.

Two standard versions allow use with either fault switches or Murphy ES series resistive senders:

Part numbers	Model/description
79.70.0096 .	MEC301-1 MeCAN I/O module, for use with Murphy ES pressure & temperature senders
79.70.0097	MEC301-2 MeCAN I/O module, for use with pressure & . temperature switches (closing to negative DC on fault)

Electrical Connection & Mounting : MeCAN

Electrical Connection

MeCAN connection is via 9 color-coded flying leads (see diagram on page 8)

RED: Power supply positive DC

BLACK: Power supply negative DC

Connect these wires to a smooth DC power supply in the range 7 to 35VDC. A 1amp anti surge fuse is recommended in the DC line. MeCAN operates with negative earth/ground or fully insulated DC systems. **DO NOT** use MeCAN with positive earth/ground systems.

VIOLET: Speed input signal

YELLOW/ GREEN: Speed input return

GREY: Speed calibration input (5 kOhm potentiometer)

Connect the violet wire to a magnetic pickup or speed sensor signal output. Connect the yellow/green wire to the speed signal return wiring (or battery negative on ground/negative-return systems). This input requires a speed signal of 3-30 VAC rms.

Before calibrating the speed input connect a 5kOhm potentiometer between grey wire and battery negative DC. MeCAN allows adjustment for speed signals between 10 and 180 pulses per engine revolution. The potentiometer can be removed in normal operation.

WHITE: Coolant temperature sender/switch input

ORANGE: Oil pressure sender/switch input

Part number 79.70.0096 is designed for use with Murphy ES series resistive senders. For best measurement accuracy, use insulated return (2-wire) senders. Connect one terminal of each sender to the appropriate MeCAN input lead; connect the other sender terminals to MeCAN's Sender Common (black) wire. Where 1-wire (negative DC/ground return) senders are used, connect the black (sender common) wire to battery negative.

79.70.0097 is configured for use with low oil pressure and high coolant temperature switch contacts that close to negative DC on fault. For insulated return (2-wire) switches, connect one switch terminal to the appropriate MeCAN input; the second terminal from ach switch (on 2-

wire switches) or the body ground (on 1-wire switches) must be connected to MeCAN's sender/switch common (black) wire.

BLUE: Shutdown output

This open collector transistor output gives a negative DC signal, rated 250mA max, on detection of fault conditions. The output latches following the fault condition, and can be deactivated by removing the DC power supply. The output can be used to drive a warning lamp, audible alarm, suppressed relay coil or ECU shutdown circuit.

3.8.1 Operation and Maintenance

Operation

MeCAN begins transmitting J1939 CANbus immediately after power-up. Data can be viewed using a J1939 compatible display, e.g. The Murphy PV101, or used as a part of a J1939 control system, eg. Murphy CANstart or CASCADE modules.

Engine oil pressure and coolant temperature

Model 79.70.0096 transmits pressure and temperature data when the resistive sender inputs are within normal range. MeCAN also transmits appropriate J1939 SPN (Suspect Parameter Number) and FMI (Fault Mode Indicator) codes if:

- Input resistance is out of normal sender range, e.g. open or short circuit.
- Oil pressure drops below 20psi (warning message) and 10psi(shutdown/derate message)
- Coolant temperature rises above 100C/212F (warning message) or 110C/230F(shutdown message)

Model 79.70.0097 transmits pressure and temperature data in accordance with the input switch position:

	Input switch closed(to –DC)	Input switch open
Oil pressure data	0 psi & SPN/FMI code	100 psi
Coolant temperature data	105C / 221F & SPN/FMI code	90C / 194F

Oil pressure fault codes are not transmitted until 10 seconds after engine starting, once speed has risen above 800 RPM.

Engine speed data

RPM data is transmitted whenever a valid speed signal is present (above the minimum 3V rms). If engine speed exceeds 3500 RPM, MeCAN also transmits the appropriate J1939 over speed fault SPN and FMI code.

<u>Battery voltage</u>

MeCAN measures its DC power supply voltage and transmits this as J1939 'electrical potential' data (PGN 65271).

<u>Hours run</u>

MeCAN transmits 'engine hours run' data (PGN 65253). The hours run value is stored in non-volatile flash memory and increases only while engine speed is above 500 RPM. To prolong internal flash memory life, hours run data is updated at 3 minute intervals.

Maintenance

MeCAN contains no user-serviceable parts. Maintenance is therefore limited to the following preventative checks:

- Check that MeCAN electrical connections are secure.
- Check that the case is mounted securely, with vibration and environmental exposure minimized where possible. The case may be wiped with a clean, damp cloth. Do not use cleaning solvents

3.9 XM 500 :

Features

- Adds I/O to J1939 Network
- Works with Standard J1939 Display Modules
- Wide Operating Temperature range
- Industry standard Deutsch enclosure and connectors
- Custom programming available
- Easy-to-use Configuration Tool available

The XM500 Module is a configurable Input/Output (I/O) module designed to bring analog and digital inputs and output onto the SAE J1939 Controller Area Network. The XM500 Config Tool provides a user friendly interface allowing the user to create or change the configuration used on the XM500 module.

XM500 is ideally suited to bring the additional information you need onto the J1939 CANbus, and can be configured to broadcast fault codes and activate digital outputs per input condition such as Fuel Level Low, Hydraulic oil Temperature High, etc. Because the XM500 broadcasts information using the J1939 standard protocol, the information can be displayed using standard J1939 display modules, such as the PowerView PV101.

In this application XM500 is used for transmitting Gear Oil Temperature, Gear Oil Pressure, Coolant Pressure, Sea Water Pressure, Engine Oil Temperature, Exhaust Temperature (

Thermocouple I/P can be used), Engine Oil Differential Pressure High, etc onto CAN bus network for displaying on PV450 and HV750 respectively.

Specifications

Power Input: 8 to 28VDC

Operating Temperature: -40 to 85C (-40 to 185F)

Digital Inputs: 4 – Ground or battery positive activation

Digital Outputs*: 2 Sinking (500mA)

*(outputs are NOT reverse polarity protected. Damage will occur if B+ is connected to the outputs. Damage incurred from improper installation is not covered under the manufacturer warranty policy)

Thermocouple Input: Type K and Type J

Analog Inputs:

1- Battery Supply Voltage (dedicated)

2- Configurable as 0-5VDC, 4-20mA, resistive senders or used as an additional Digital Input

Speed Sensing Input: Magnetic Pick-up (2 to 120VAC RMS from 30 to 10,000Hz)

Communication Ports: CAN J1939

Product Weight: 10 ounces

Shipping Weight: 12 ounces

Shipping Dimensions: 4" X 6" X 2"

<u>**Note**</u>**:**

1. **When the thermocouple input is used, only 5 resistive, 4-20mA, 0-5VDC can be used instead of 7.**
2. **Analog inputs can be exchanged for digital inputs (battery ground activation only), for a total of eleven digital inputs.**
3. **Other resistive senders can be supported.**

3.9.1 Connector Diagram :

CONNECTOR (Grey)
Deutsch DTM06-12SA

CONNECTOR (Black)
Deutsch DTM06-12SB

3.9.2 Wiring Diagram :

XM500 I/O MODULE TO PV101 (78-70-0420)

NOTES
1. ⌇ TWISTED WIRES OR SHIELDED CABLE. APPROXIMATELY ONE TWIST PER INCH.
2. ALL SENDERS MUST BE GROUNDED TO A COMMON BATTERY GROUND.
3. SENDERS CAN BE RESISTIVE, 4–20mA, 0–5V.
4. USE ONLY SAE-J1939 COMPLIANT SHIELDED CABLE: RADOX SAE J1939
5. WARNING: TWO 120 OHM RESISTORS SHOULD BE LOCATED AT OPPOSITE ENDS
   OF THE J1939 CAN BUS. FAILURE TO COMPLY WILL CAUSE BUS FAILURES.
   ONLY TWO 120 OHM RESISTORS ARE ALLOWED ON THE CAN BUS.
6. DIGITAL OUTPUTS ARE 'SINKING' ONLY AND NOT REVERSE POLARITY PROTECTED.
   CONNECTING B(+) WILL DAMAGE THE UNIT AND VOID THE WARRANTY.

3.10 Power View 450 :

Features
- Compact CAN-based display to fit your application
  with freely configurable design
- Customize the bezel, buttons, I/O interface and
  more
- Easy-to-use Power Vision Configuration Studio
- Bonded LCD screen viewable in direct sunlight
- Rugged / Reliable Design
- Endless possibilities

The Power View 450 display features a freely configurable design. Any of the major components can be custom engineered to meet your exact needs. It's an incredible amount of customization with minimal non-recurring engineering costs.

You can change the shape of the bezel and buttons. You can rework the I/O board to add extra inputs. You can add custom graphics and company branding to the interface.

The Power View 450 display is compatible with Power Vision Configuration Studio, so you can continue to make quick and easy changes to the display. The PV450 display is also highly durable. See the full specs on the back of this sheet for a full overview of its technical features.

3.10.1 Specifications

Technical

Display: Bonded 4.3" color transmissive TFT LCD
Resolution: WQVGA, 480 x 272 pixels, 16-bit color
Aspect Ratio: 16:9
Orientation: Landscape or portrait
Backlighting: LED, 500-650 cd / m2 (30,000 hr lifetime)
Microprocessor: Free scale iMX35 32bit, 532Mhz
QNX Real-Time Operating System

Flash Memory: 256 MB (expandable to 8GB)
RAM: 128 Mbytes DDR2 SDRAM
Operating Voltage: 6-32 VDC, protected against reverse polarity and load-dump
Power Consumption: 10W max
CAN: Two CAN 2.0B; optional NMEA 2000 isolation
RS-485: 1 MODBUS Master/Slave
Video input (Optional): Two NTSC/PAL input channels with one displayed at a time.
Protocols: J1939, NMEA 2000, CAN open
Connection: 4 Deutsch DT 6-pin connectors
Keyboard: 8 tactile buttons
USB 2.0 host (full speed), optional OTG support
Output: (1) Open-drain, capable of syncing 500 mA
Input: (1) Resistive, 0-5 V, or 4-20 mA (software configurable)
Real-time clock with battery backup

Environmental
Operating Temperature: -40°C to +85°C
Storage Temperature: -40°C to +85°C
Protection: IP 66 and 67, front and back.
Emissions and Immunity: Electromagnetic Compatibility: 2004/108/EC
EN 61000-6-4
EN 61000-6-2 (immunity)
EN 501121-3-2
EN 12895
J1113/2, 4, 11, 12, 21, 24, 26 and 41
Vibration: Random vibration, 7.86 Grms (5-2000 Hz), 3 axis
Shock: ± 50G in 3 axis

Additional Options
LCD Touch screen (projected capacitance) capability

3.10.2 Dimensions

8-32 X .25" DEEP BRASS INSERTS
4-PLACES

4X Ø.148
[3.75]
(FITS 6-32 SCREW)

D   C   B   A

3.799   3.357
[96.50] [85.28]

GIMBAL MOUNT PAD

1.929
[49]

6.378
[162]

6.914
[175.61]

7.356
[186.84]
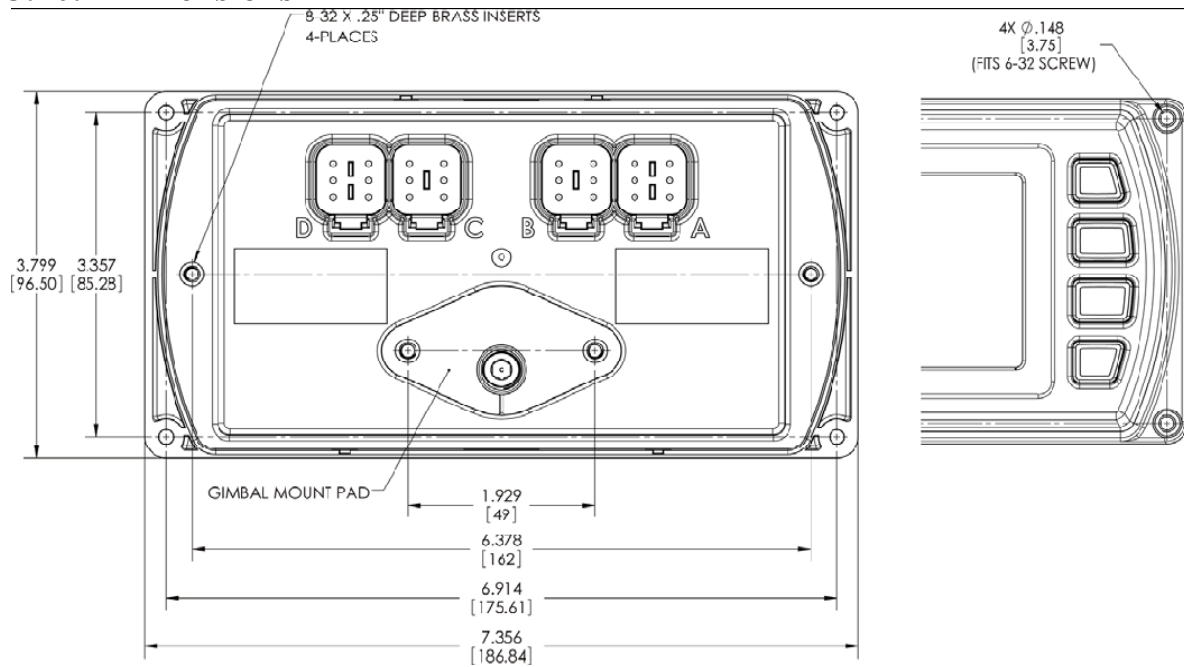
3.10.3 Downloading program into PV450:

PV450 configuration can be downloaded either with laptop or with a USB stick. But since laptop and its accessories is not easily available when required we will focus on USB stick downloading procedure.

Requirements:-

1. 1GB USB stick of any manufacturer.

2. USB data cable for PV450.

Downloading procedure:-

1. Switch off the power supply of PV450.
2. Connect USB stick to PV450 as per shown in below image.

Connecting USB stick to HV750

3. Press two function keys together as shown in figure before turning on the power supply.

4. Do not release the keys until device is power up and below screen appears.

5. Once device is completely power ON below screen will appear.

6. Now press the key show in above image then below screen will appear.

7. Again press the same key as shown in above image to start downloading process. Once downloading starts below screen will appear.

8. Above image shows downloading under process and once downloading completes following screen will appear.

9. After this device will once again reboot and then start-up screen will appear. With this downloading process is completed.

3.10.4 Power view 450 Button Functions

This PV 450 has eight functional buttons. These buttons can be programmed based on application requirement.

F1 Button

Not assigned in this system

F2 Button

Not assigned in this system

F3 Button

This button is programmed for displaying previous screen.
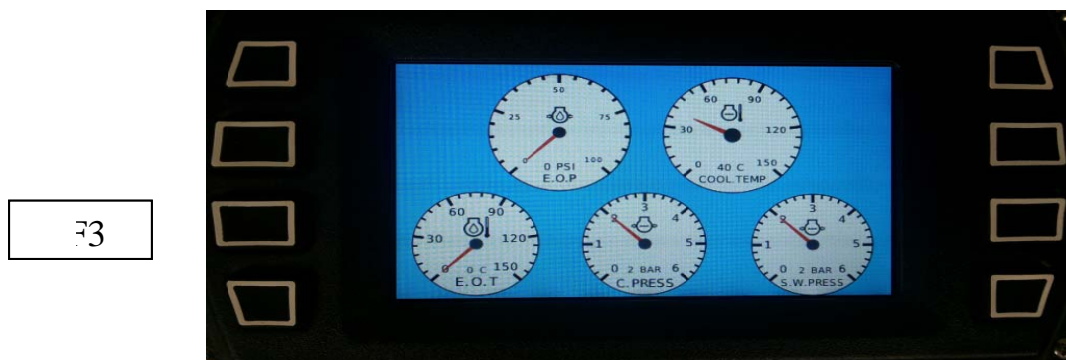
2nd Screen display in PV 450

For eg: if above screen appears and user press this button then below screen will be displayed.
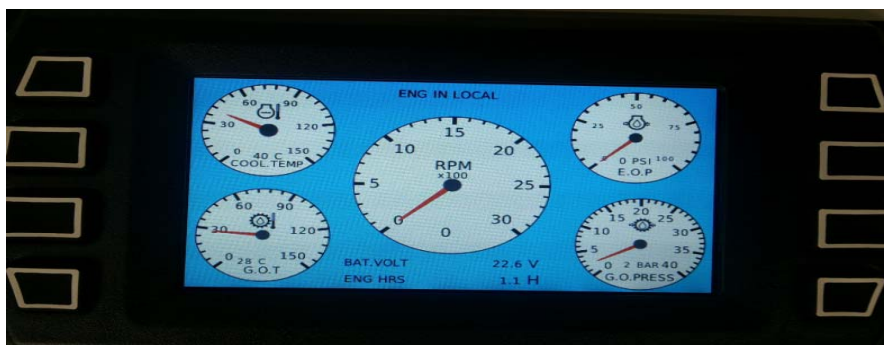
1st screen display in PV 450

F4 Button: Also called Menu Button

This button is programmed for displaying device configurations screen . From this menu user can make modification in device settings like brightness, date and time, J1939 source address, monitoring parameter units, etc. Details on this are provided later under PV450 device configuration descriptions.

User can enter into this screen by pressing F4 button on 1st screen.

F4
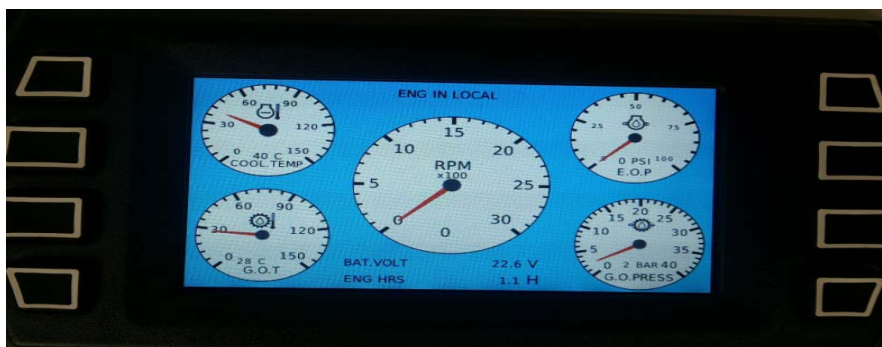
1st screen display in PV 450

Following screen will be displayed.

Device configuration screen in PV 450

F5 Button

Not assigned in this system

F6 Button

Not assigned in this system

F7 Button

This button is programmed for displaying next screen.

F7

1ˢᵗ Gauge display screen in PV 450

For eg., if above screen appears and user press this button then below screen will be displayed.
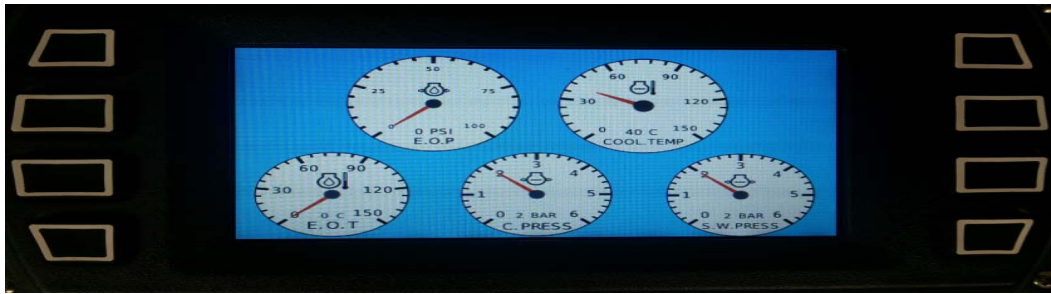
2nd screen Gauge display screen in PV 450

F8 Button

Not assigned in this system

3.10.5 Device Configuration Description in PV 450:

1. At the main menu, press the soft key to the left of 'Utilities'.

2. The Utilities sub-menu is displayed.

3. From the 'Utilities' sub-menu, select 'System Settings'. The following screen is displayed.
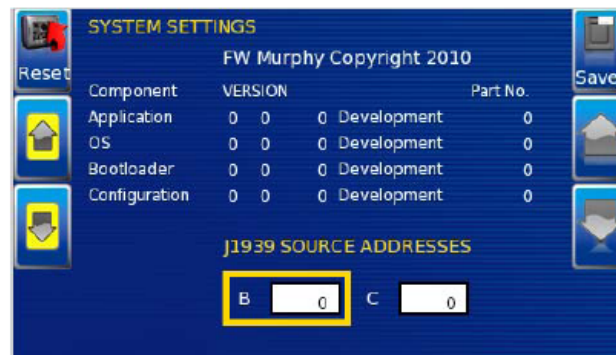
4. With the cursor highlighting the J1939 source addresses, use the left side soft keys to scroll through the ports and the right side soft keys to change the address. Press the

Save key to save selected changes or the Restore Defaults key to return to the d settings.
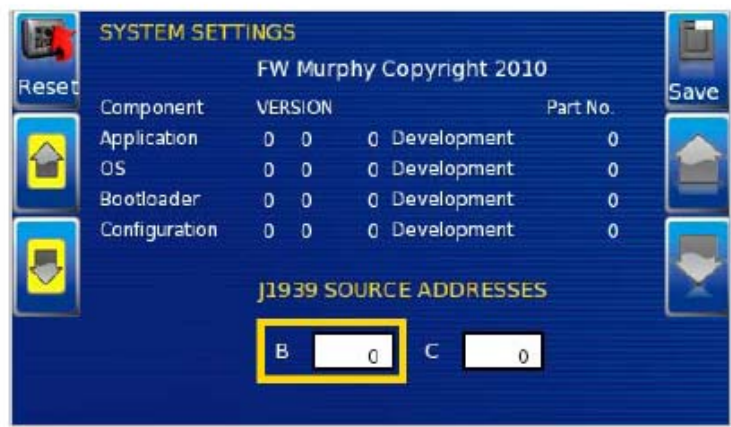
Main Menu

The main menu is activated at any time by pressing the **Menu** key on the display.

The following features are accessed through the main menu:

- **Gauge Display** – provides a series of screens that display engine and auxiliary information in a variety of formats.
- **Engine Diagnostics** – displays a list of engine fault codes and descriptions through a DM1 message structure.
- **User Settings** – allows you to customize the display options for ambient light and brightness, set US or metric units, language, specify the Home screen and screen setup status.
- **Utilities** – allows configuration of the plug address. Also displays software version information at the top of the page.

Gauge Display

The Gauge Display screen consists of several predefined layouts that contain combinations of analog gauges, straight bar gauges, or digital (text) readouts. These screens are displayed upon startup.

To scroll through the various gauge screens, press the **Prev** and **Next** soft keys. This can be repeated until all screens have been viewed. The currently displayed screen will stay active until another key is pressed.

Soft Key Commands

When a Gauge Display screen is active, pressing the **Enter** key will display soft key commands, as shown below. Continuing to press **Enter** will toggle through any additional soft keys, and will eventually remove the soft key commands from the screen.
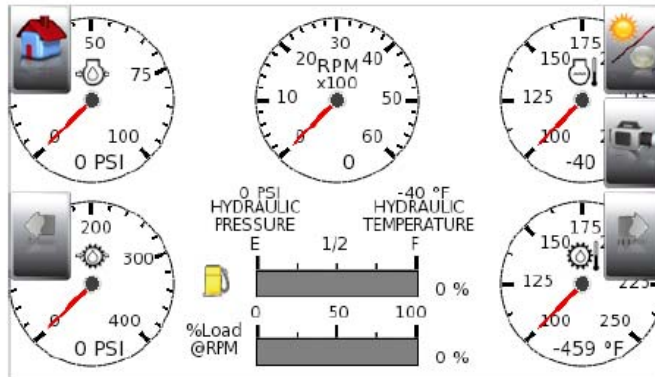
Soft Key commands provide quick navigation and access to the following features:

- Home
- Prev
- Day/Night
- Video (optional)
- Next

Home - This one-touch navigation feature allows a pre-defined Home screen to be accessed from the available Gauge Display screens. Once selected, the Home screen will be displayed anytime the **Home** key is pressed.

Day/Night - Allows you to toggle the display screen between Day View and Night View.

> **NOTE:** This feature can also be changed in the **"User Settings"** section of this manual.
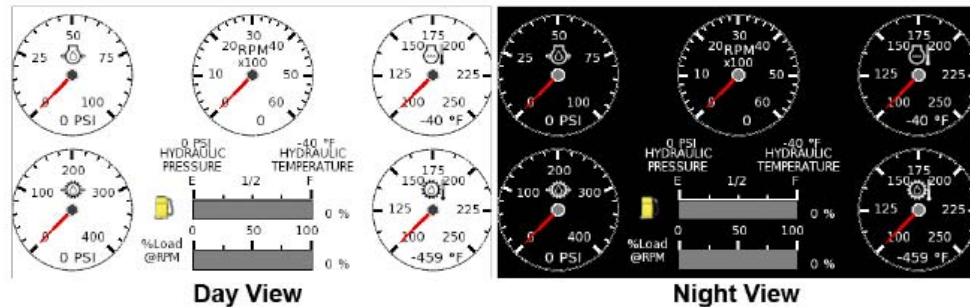
Day View   Night View

Video – When enabled, displays either full screen video or partial video within a window on the gauge display.

> **NOTE**: For instructions on how to enable full or partial screen video, refer to the **"User Settings"** section of this manual.
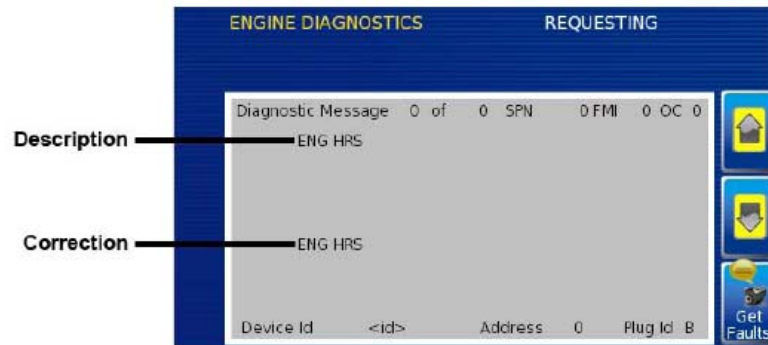

Full View Video

> **NOTE:** For instructions on how to turn screens ON or OFF, refer to the **"User Settings"** section of this manual.

Engine Diagnostics

Choosing Engine Diagnostics from the Menu, the display will query the engine(s) ECU and provide feedback on any diagnostic codes that have been activated and stored in the ECU for service needs.

The Engine Diagnostics option displays faults based on engine or auxiliary source.

The following is a list of field definitions contained on the Engine Diagnostics screen:

- **Device ID** – identifies the component having the fault; engine 1, 2, or auxiliary.

- **Address** – identifies the address of the source of the fault (populates the Device ID).

- **Status** – indicates whether the fault has been corrected.

- **SPN** –"Suspect Parameter Number" - fault code
  If not translated into text by the PV450 display, see the engine manufacturer's literature for the definition of the SPN number.

- **FMI** – "Failure Mode Indicator" - fault code
  The FMI is defined by SAE J1939. If not translated into text, see the SAE standard, or the engine manufacturer's literature.

- **Occurrence Count (OC)** – The number of times the event has been flagged.

- **Description** – Most common SPN's and FMI's have text for the description stored in the PV450 display. If there is no text, then this SPN and FMI must be defined by referring to the engine manufacturer, or the SAE J1939 standard.

- **Correction** – Trouble-shooting guidelines for corrective action to take in addressing the fault.

> **NOTE:** This field is only used with certain brands and models of engines.
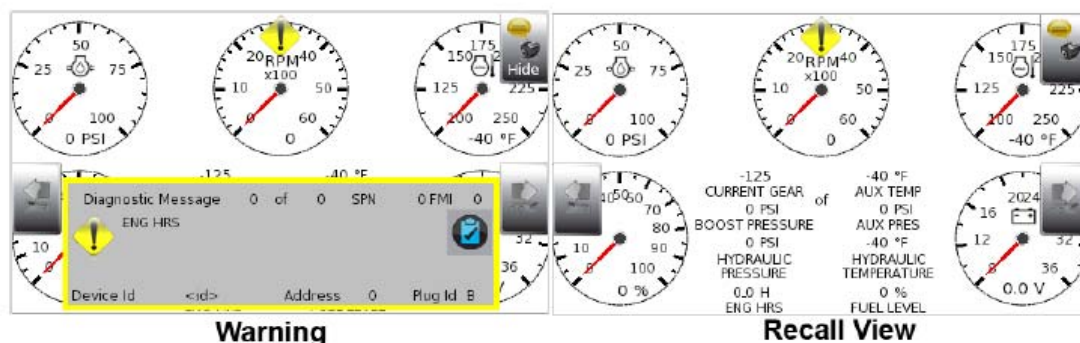
Fault Code Popups

A fault condition will trigger a popup dialog box on the screen describing the nature of the fault. Corresponding red or amber fault lights on the corners of the unit are also activated to indicate the severity of the fault. The following screens are examples of warning and shutdown fault code popups.

Warning

Shutdown

How to Hide/Show Faults

To hide the fault code popup being displayed on the screen, press the soft key on the right next to the "Hide" icon. The popup will disappear, however the "Warning" or "Stop" icon will remain on the screen to indicate there is still a fault. Pressing "Hide" does not clear the fault; it only hides the popup message.

When a fault code has been hidden, a "Recall" icon will remain on the right side. When this soft key is pressed, the fault code will again be displayed. When a popup message has been activated, a pop-up message will be displayed until the alarm is acknowledged by pressing the "Hide" key.

Warning

Recall View

Scrolling Through Multiple Messages

The title-bar of the fault code popup may indicate multiple messages, as in 'Diagnostic Message 1 of 3. Press the **Prev** and **Next** keys to scroll through the different messages.

User Settings

User Settings provides options to specify viewing preferences for the PV450 Display. Pressing yellow **Up** and **Down** arrows navigates through the options. To change an option, press the corresponding soft key button next to the desired soft key command.
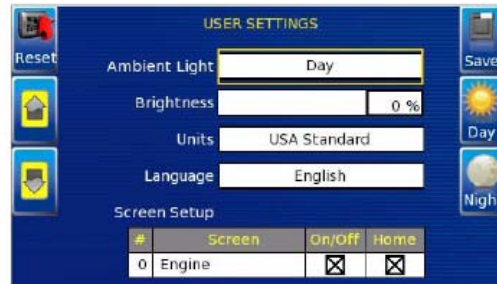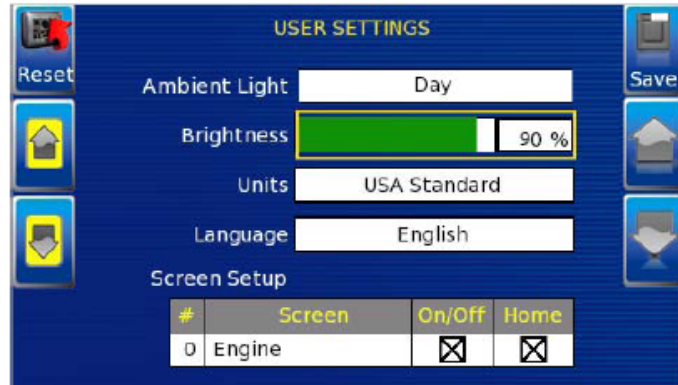

Ambient Light

Night and Day options are provided for ambient lighting. The screens below illustrate these options. When the ambient lighting settings are changed in User Settings, the power-on default is changed.

Day View   Night View
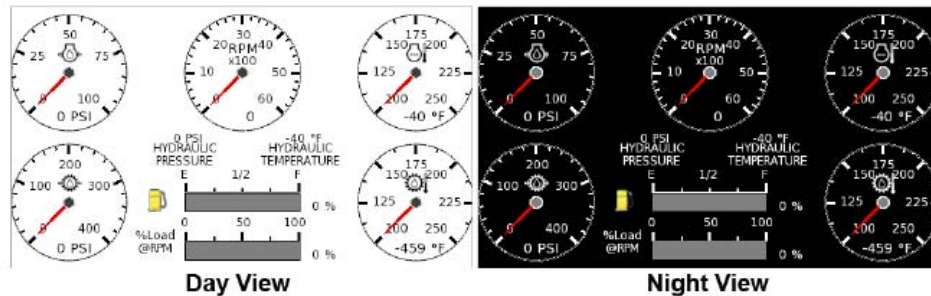
> **NOTE:** The ambient lighting option is also accessible through soft key commands on the gauge display screens. When selected, the **Day/Night** soft key toggles the display to the opposite mode.

Brightness

You can set the brightness control by using the soft keys to change the settings in +5 increments until the desired brightness is achieved.

> **NOTE**: Brightness level will change with ambient light setting. Two brightness levels are saved; one for day and one for night.

Units

Select how units are displayed by using the soft keys to select from the following:

- USA Standard
- Metric Bar
- Metric kPa
- British Standard
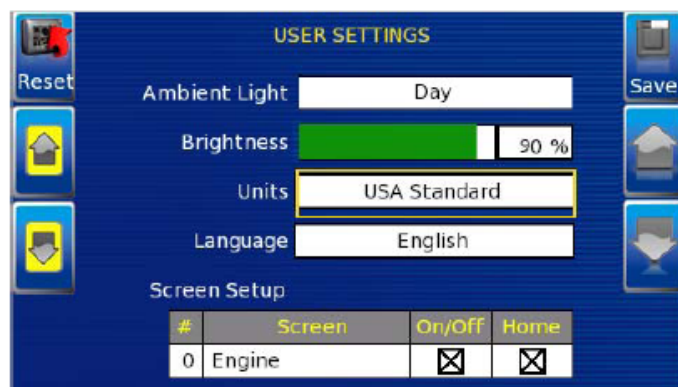
Language

This option allows you to select the language that will be displayed on the PV450. Availab[le] languages include English, French, Spanish, German, Italian, and Chinese. Languages a[re] selected from the soft keys. Press the **Down** arrow to view additional languages. Addition[al] languages include: Russian, Czech, Japanese, and Brazilian Portuguese.
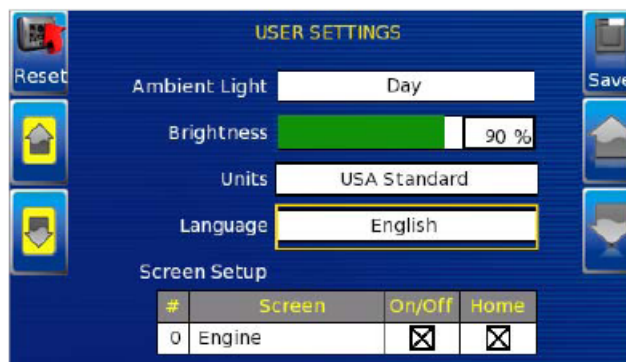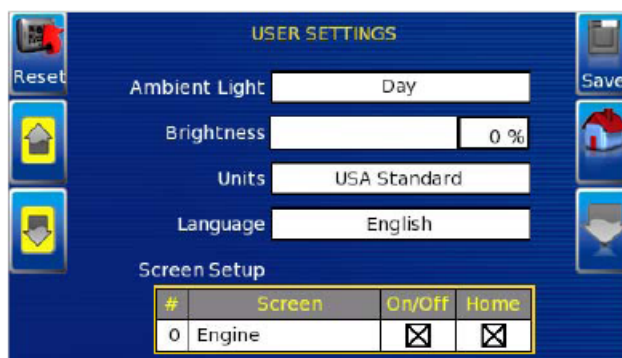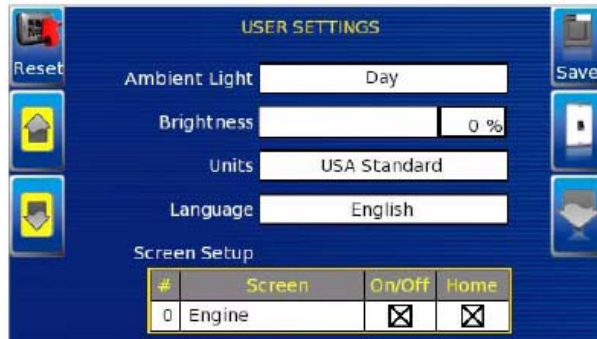

Screen Setup

The Screen Setup option provides a list of screens that can be shown when accessing the Gauge Display screens.

- Press the **Up** and **Down** arrow keys on the right to scroll through the screens.

- Press the "**Home**" soft-key to select the screen as home.

> **NOTE:** An X in the "**On/Off**" checkbox indicates the screen is on. A blank checkbox indicates the screen is turned off.

The Screen Setup screen also provides the user the ability to turn the screens ON or OFF by pressing the **Enable/Disable** soft key. If a screen is turned OFF, it will not show up when Gauge Display is activated.

Home Screen

The Home Screen will be the first screen shown when Gauge Display is selected from the User Setting menu. The Home Screen is set to Engine by default and can be changed using the Screen Setup options on the User Settings screen.

Video (Optional)

By default, the Video screen is on or 'Enabled'. To 'Disable' video, change Video option to 'Off' in the screen setup dialog box using the Enable/Disable key in the top right corner. An updated image showing video screen highlighted / off will be displayed.

Save

Once all changes have been made, press **Save**. The following confirmation screen is displayed.

Restore Defaults

Restore Defaults sets the display to the original factory settings. During troubleshooting, this can be used as a last resort to completely reset the display to a known state.

To restore the default user settings, press **Restore Defaults**. The following confirmation screen is displayed.
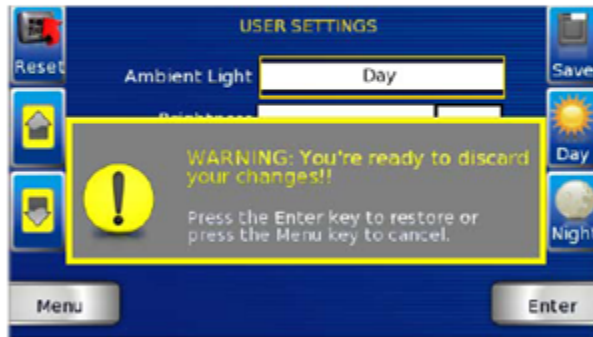
Utilities

Utilities allow you to reset external gauges and configure communication settings. It is typically only accessed when the unit is first installed in order to configure the unit. The following sub-menu is displayed when Utilities is selected.

In this menu F1 button is used for log in to the System settings .F2 is used for log in to Service reminders. And also the F3 soft button will helps to log in Date and time setting screen. Below explaining about the Sub menu functions.

System Settings

The System Settings screen displays the current software version loaded on the PV450 display. You can set individual settings for the available options and "**Save**", or choose to select "**Restore Defaults**" for the factory settings.


The yellow **Up** and **Down** keys on the left allow you to move the cursor through 'J1939 Source Addresses' fields. While the cursor is highlighting a field, the gray **Up** and **Down** keys scroll through available options. Once all the options have been selected, press **Save**.

Service Reminders

This option allows you to reset the 5 built-in service reminders:

- Change Engine Oil – Default interval 50.0 Hrs.
- Chang Air Filters – Default interval 75.0 Hrs.
- Change Hydraulic Oil – Default interval 100.0 Hrs.
- Service Engine – Default interval 125.0 Hrs.
- Service Machine – Default interval 150.0 Hrs.
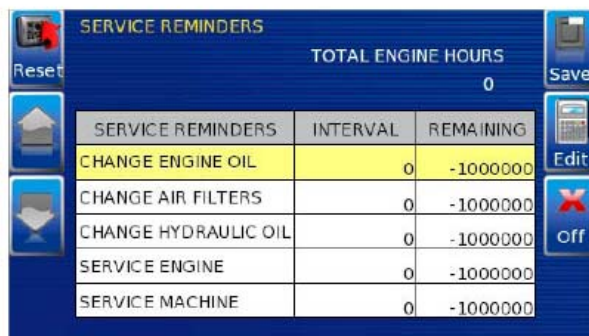
Date and Time

The F3 button is used for setting the time and date in the system. When the user log in to the date and time setting screen, here two arrows will present in the left hand side of the screen. The yellow UP arrow will used the cursor to move up ,and the yellow Down arrow is used cursor to move down. These arrows will helps to select the specific position of date and time. And also two arrows will present in the right hand side of the screen which will used for editing the values

of date and time. The F5 Soft button has the function of saving the reset values. Below showing the Date and Time Screen.

Date and Time Screen in PV 450

3.11 Helm View 750 :

Features

- ABS Type Approved display for Marine and Offshore Applications on ACC, ACCU and ABCU Classed Vessels (Model HV750 only)
- Color display for modern electronic engines and vessel monitoring using SAE J1939 Controller Area Network
- Customizable for additional Commercial Marine applications
- Bonded 7-inch LCD screen viewable in direct sunlight
- Rugged design that is simple to use
- Video input
- Configuration Software option offers virtually unlimited possibilities
- Blackout Mode Option

The **Helm View HV750** is specifically designed to meet the engine monitoring needs of the Commercial Marine industry. Its durable design and easy to use interface offers a complete view of your vessels engines. Monitor propulsion, auxiliary, transmission, and genset engines all on one display. It is equipped with the ability to switch between Day and Night mode operations and even has a blackout option. There are multiple screens to choose from and the ability to turn screens on/off to meet your specific marine application needs. The Helm View 750 has the ability to be connected to a video camera for monitoring the engine room or other important areas of the vessel.

This multi-functional display allows you to monitor multiple engines, transmissions, fuel usage, and more using only one device, thus greatly reducing operating costs. It has ten tactile push buttons that can easily be pressed with or without gloves. The Helm View 750's sunlight viewable, full-color screen makes seeing life-like gauges, alarm warnings, service codes, and

video easy to view in virtually any condition. The Helm View 750 is fully programmed to display Diagnostic Trouble Codes showing critical alarms and text explanations.

The Helm View 750 display is compatible with the Power Vision Configuration Studio so custom software configurations can be quickly developed. With the Power Vision Configuration Studio it is easy to define the user interface screens, monitoring

Requirements and specifications those are unique to the Commercial Marine industry. The Helm View 750 paired with the Power Vision Configuration Studio extends custom configuration from only monitoring to equipment control, data logging, and additional alarming. You can even add custom graphics and company branding to the user interface.

Display Parameters

The following are some of the parameters displayed by the Helm View 750 in English or Metric units (when applicable, consult engine or transmission manufacturer for SAE J1939 supported parameters).

- Engine RPM
- Engine Hours
- System Voltage
- % Engine Load at the Current RPM
- Coolant Temperature
- Oil Pressure
- Transmission Oil Temperature
- Transmission Oil Level
- Tank Levels
- Course over Ground*****
- Speed over Ground*****
- Longitude and Latitude*****
- Real Time Display*****
- ***NMEA GPS Antennae required**
- Instantaneous Fuel Usage
- Trip Fuel
- Navigational Bearing
- Active Service codes
- Stored Service Codes (when supported)
- Video

3.11.1 Specifications
Technical
Display: 7" / 178mm color transmissive TFT LCD
Resolution: WGA, 800 x 480 pixels, 16-bit color
Aspect Ratio: 16:9
Orientation: Landscape
Backlighting: LED, 400-500 cd / mC (50,000 h lifetime)
Microprocessor: Free scale iMX.31 32bit, 400Mhz
QNX Operating System

Flash Memory: 2 GB
RAM: 128 Mbytes SDRAM
Operating Voltage: 8-35 VDC, protected against, reverse polarity and Load-dump
Power Consumption: 10w full backlight; 22w full backlight with heater (at Temperatures below -10 °C)

CAN: 3 CAN ports according to CAN specification 2.0A or 2.0B; one port Isolated according to NMEA 2000 (GPS)

RS485: 1 MODBUS Master/Slave port, PVA Gage
Video input: NTSC/PAL
Protocols: J1939, NMEA 2000 (GPS), CAN Open protocol support.
Connection: 5 Deutsch DT 6-pin connectors
Keyboard: 10 tactile buttons

USB 2.0 host (full speed)
Output Digital: (1) capable of syncing 500mA
Inputs: (3) 0-5 VDC analog inputs. (1) input configurable to support measurement Frequencies from 2Hz - 10 kHz and PWM values from 0-100% Duty cycle.

Environmental

Operating Temperature: -40°C to +85°C (-40°F to +185°F)
Storage Temperature: -40°C to +85°C (-40°F to +185°F)
Protection: IP67, front and back.
Emissions: IEC 60945, 95/54/EC
Immunity: SAE J1113, ISO 11452
Vibration: Random vibration, 7.86 Grms (5-2000 Hz), 3 axis
Shock: +/- 50G in 3 axis

Mechanical

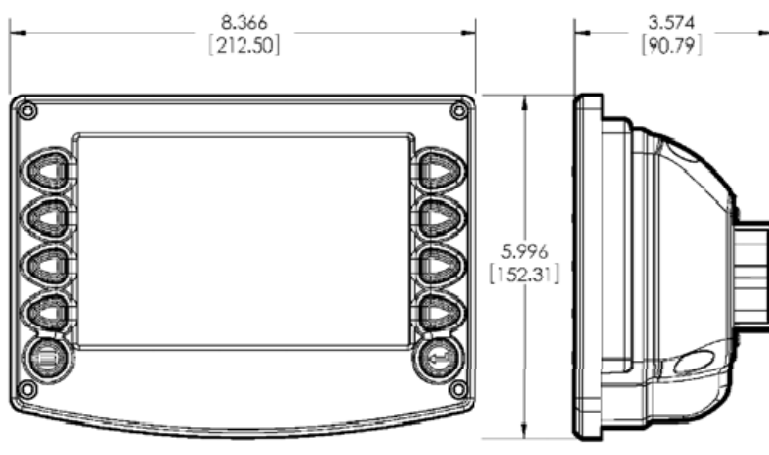**Dimensions**: 8.37 x 6.0 in. (212.5 x 152.3 mm) landscape
Unit Depth: 3.57 in. (90.8 mm)
Case material: Polycarbonate back case
Mounting: Front or Rear
Optional Gimbals Mount available

3.11.2 Dimensions

Accessories
- Power Vision Configuration Studio (78-00-0752)
- Visor Kit (78-00-0732)
- GPS Kit (78-00-0601)
- Gimbal Mounting Kit (78-00-0697)
- Contact FW Murphy for cable and wiring accessories

Service Parts
- Cover Plate (78-05-0701)
- Bezel (78-05-0720)
- Hardware Mounting Kit (78-00-0638)
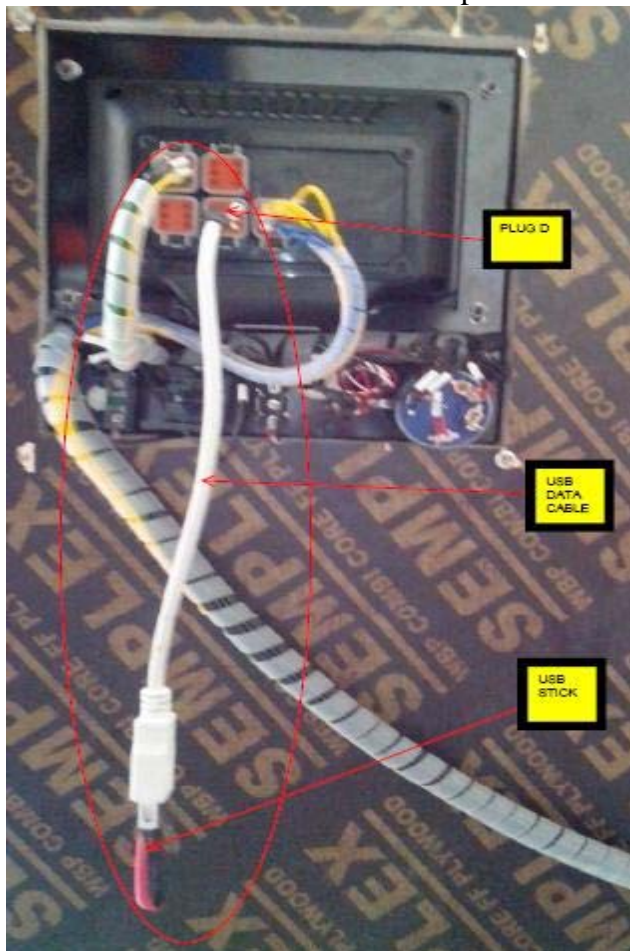
3.11.3 Downloading program into HV750:

HV750 configuration can be downloaded either with laptop or with a USB stick. But since laptop and its accessories is not easily available when required we will focus on USB stick downloading procedure.

Requirements:-

1. GB USB stick of any manufacturer.

2. USB data cable for HV75.

Downloading procedure:-

1. Switch off the power supply of HV750.
2. Connect USB stick to HV750 as per shown in below image.

Connecting USB stick to HV750

3. Press two function keys together as shown in figure before turning on the power supply.

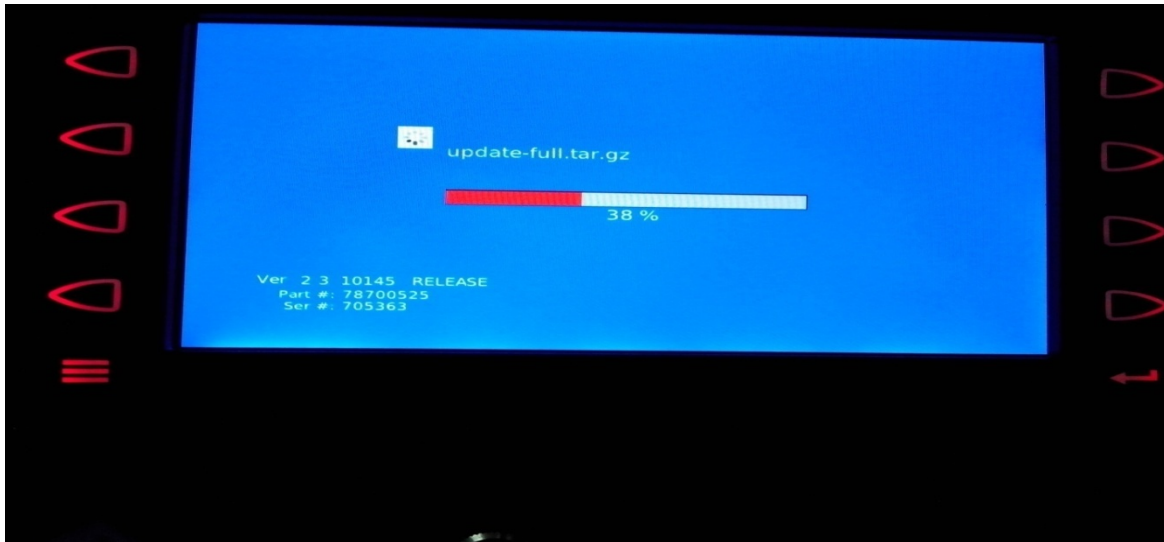4. Do not release the keys until device is power up and below screen appears.

5. Once device is completely power ON below screen will appear.

6. Now press the key show in above image then below screen will appear.
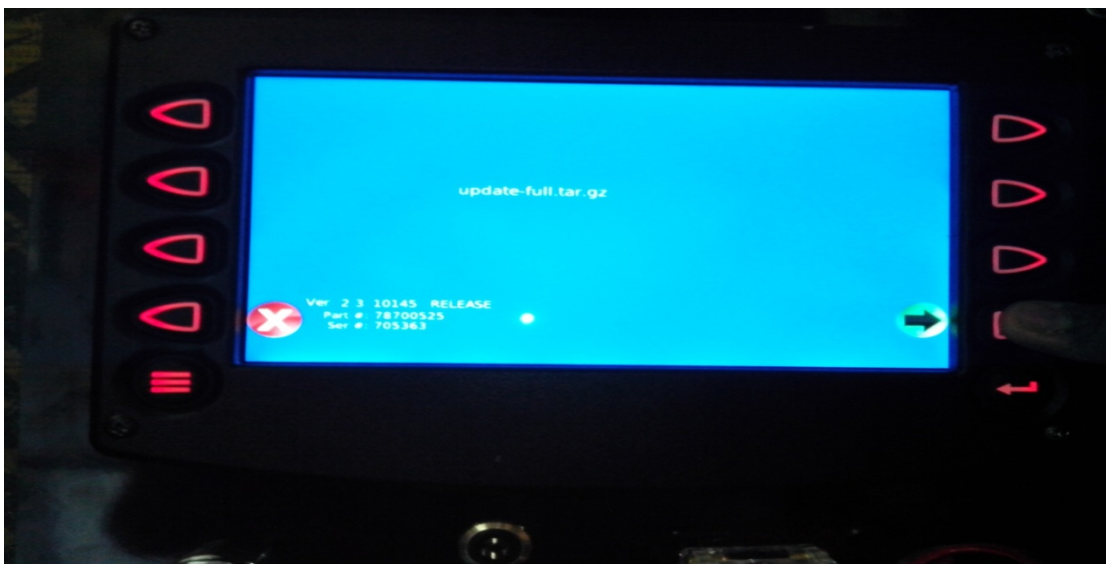
7. Again press the same key as shown in above image to start downloading process. Once downloading starts below screen will appear.

8. Above image shows downloading under process and once downloading completes following screen will appear.

9. After this device will once again reboot and then start-up screen will appear. With this downloading process is completed.

3.11.4 Helm View 750 Button Functions

1st screen of HV750 after reboot/restart.

HV 750 have ten functional keys as shown above.

Functions assigned to these keys are given as follows;

F1 Button: Service Reminder Settings

Press F1 button for editing servic reminders. After pressing F1 below screen will appear for entering presetted password for making changes in service reminder settings.
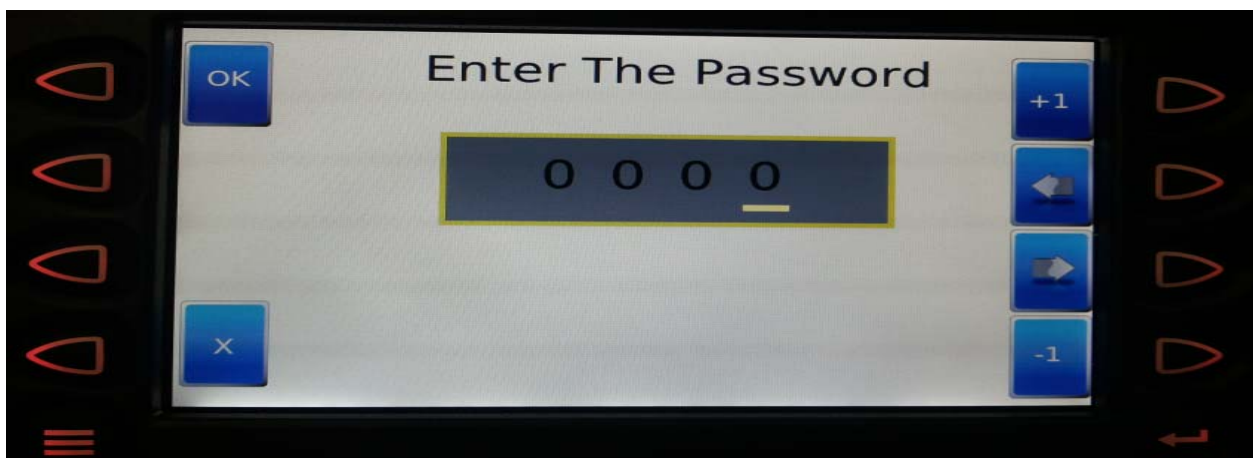

Password entering screen for service reminders settings

User can enter the password using this screen. Once correct password is detected by system it will display service reminder settings screen as shown below. If password entered is incorrect then system will display main screen i.e., **1st screen.**

Selection of password digits can be done using F5 AND F6 buttons respectively. Individual password digits can be increase or decrease using F5 AND F7 respectively. For entering password into the system F1 button should be pressed and for cancelling it press F4 button respectively.

When set and entered password matches then following screen will be displayed for editing service reminders .
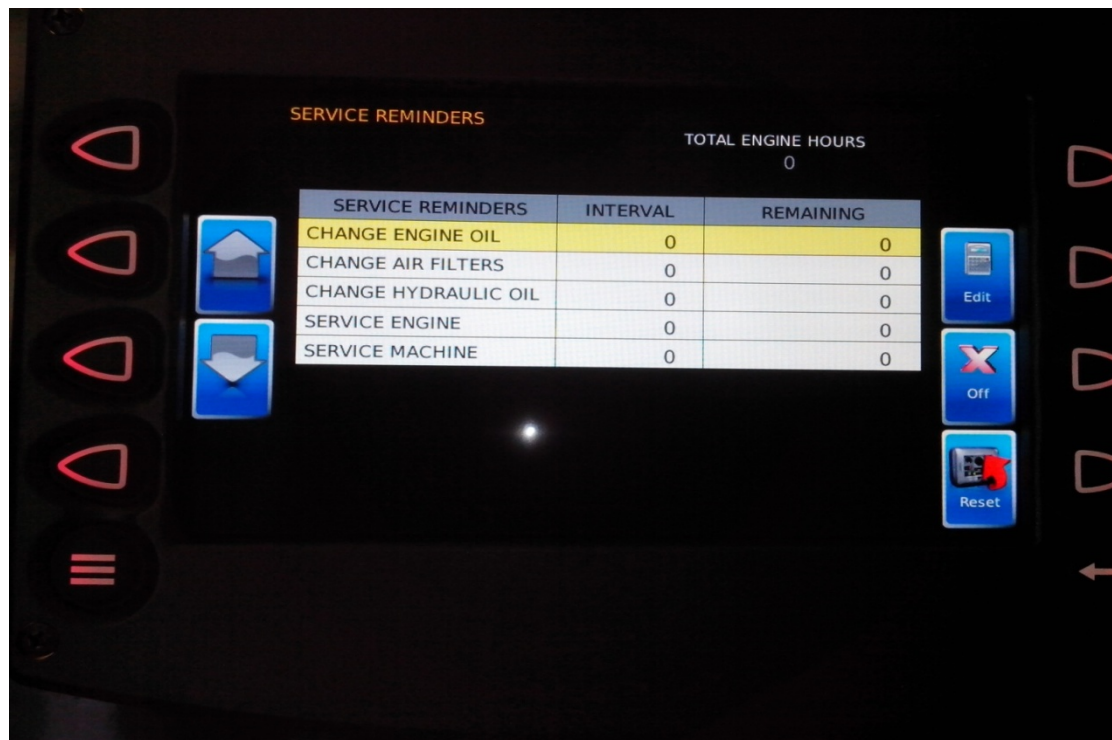
Sevice remainder screen in Hv 750

Details on editing service reminder is explained in further section.

F2 Button: Disabled

It is not assigned in this system

F3 Button: Disabled

It is not assigned in this system

F4 Button: Next Screen

This button is programmed for displaying previous screen.

F4

HV 750 Screen No.2

For e.g., when F4 button is pressed from screen no.2 as shown above then the system will display screen no.1 (previous screen) as shown below.

HV 750 Screen No.1

Menu: HV750 Internal Settings

This button is programmed for displaying device configuration screen. From this screen user can modify system settings based on application requirement. Details about device configuration screen is explained well in later section.

Device configuration Screen in HV 750

F5 Button: Day/ Night Toggle

This button is programmed to toggle between day and night color mode. By default system will display day mode. When user will press F5 button from screen no.2 as shown below

HV 750 Screen No.2 In Day Mode

On pressing F5 button from screen no.2(day mode) as shown above, system will display same screen in night mode as shown below.

HV 750 Screen No.2 In Night Mode

On pressing F5 button from screen no.2 (night mode) as shown above, system will display same screen in day mode as shown below.

HV 750 Screen No.2 In Day Mode

F6 Button: Disabled

It is not assigned in the system

F7 Button: Disabled

It is not assigned in the system

F8 Button: Next Screen

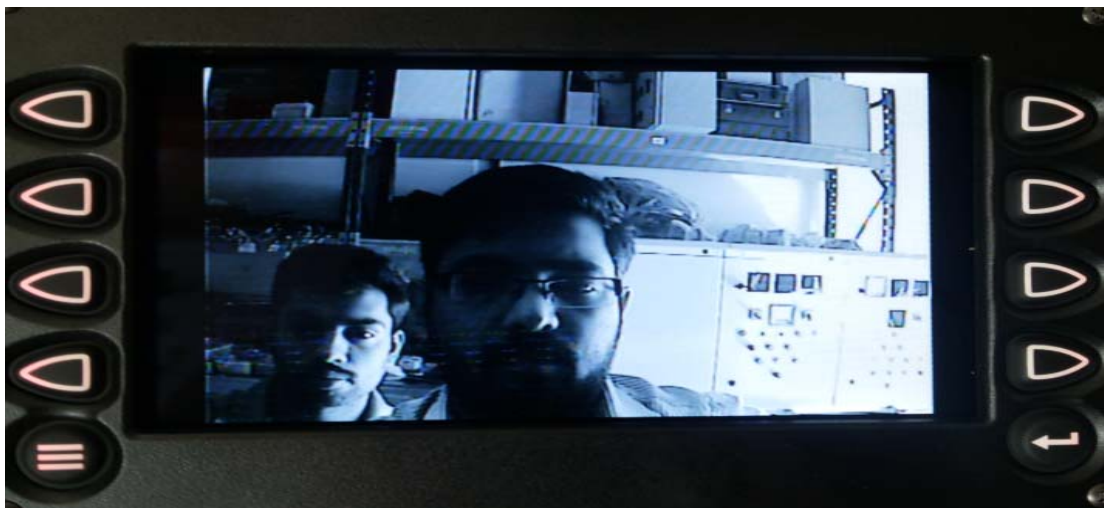This button is programmed fro displaying next screen.

F8

HV 750 Screen No.1

For e.g., when F8 button is pressed from screen no.1 as shown above, then the system will display screen no.2 (next screen) as shown below.

HV 750 Screen No.2

when F8 button is pressed from screen no.2 as shown above, then the system will display screen no.3 (next screen) as shown below.

HV 750 Screen No.2: Camera View

Enter button: Save

The enter button present at bottom on right hand side of the HV 750 is mostly used for saving the settings. Whenever the user intends to save settings after modification, this button need tp be pressed.

3.11.5 Device Configuration Description of HV 750:
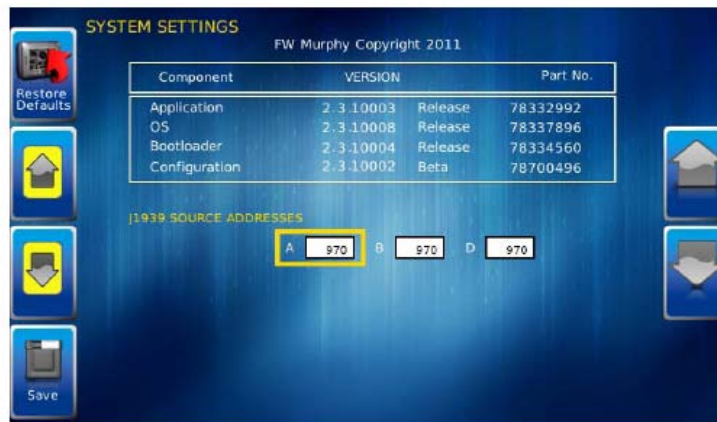
1. At the **Main** menu, press the soft key to the left of '**Utilities**'.

2. The **Utilities** displays.

3. From the **Utilities** menu, use the soft keys to select '**System Settings**'. The following screen displays.

4. With the cursor highlighting the J1939 source addresses, use the Arrow soft keys on the left to scroll through the available ports (A, B, & D). Use the Arrow soft keys on the right to change the address. Press the **Save** soft key to save changes or the **Restore Defaults** soft key to return to the default settings.

Service Reminders

Factory defaults for Service Reminders apply automatically on first use of the HelmView 750. Normally, you should not need to access the **Service Reminders** screen.

FACTORY DEFAULT VALUES

Change Engine Oil – Default interval 50.0 Hrs.

Chang Air Filters – Default interval 75.0 Hrs.

Change Hydraulic Oil – Default interval 100.0 Hrs.

Service Engine – Default interval 125.0 Hrs.

Service Machine – Default interval 150.0 Hrs.

Product Features

Power Up

The HelmView 750 display is frequently installed with power connected to the ignition. When you turn the ignition ON, the HelmView 750 powers up and you can view vital engine conditions via preconfigured gauge screens.

Main Menu

The main menu can be activated at any time by pressing the **Menu** key on the display.

Access the following features through the **Main** menu:

- **Gauge Display** – provides a series of screens that display engine, transmission, and auxiliary information in a variety of formats.

- **Engine Diagnostics** – displays a list of engine fault codes, descriptions, and messages.

- **User Settings** – allows you to customize the display options for ambient light and brightness, set US Standard or metric units, and language.

- **Utilities** – provides links to other service and information menus.

Gauge Display

The Gauge Display screen consists of several predefined layouts that contain combinations of analog gauges, straight bar gauges, or digital (text) readouts. These screens display upon startup.

> NOTE: On occasion gauges may 'grey out'; this is caused when the HelmView 750 is not reading the CAN message properly from the source address for which it is configured. This mainly occurs if the message is not being broadcast on the network, or if the settings within the display are not configured to read the parameter from the correct source.

A GPS screen is included in the HelmView 750. A GPS device must be connected to the HelmView 750 to provide time and other readings from which to calculate trip and fuel information.

To scroll through the various gauge screens, press the **Previous** and **Next** soft keys. Repeat this action until all screens have been viewed. The currently displayed screen stays active until another key is pressed. To review all screens available without accessing the HelmView 750, see the **Gauge Screens** section at the end of this document. The following section gives more information on using the Soft Key Commands.

Soft Key Commands

When a Gauge Display screen is active, pressing the **Enter** key displays other soft key commands. Continue to press **Enter** to toggle through additional soft key commands, and eventually remove the soft key icons from the screen.

Soft Key commands provide quick navigation and access to the following features:

- Previous
- Video
- Home
- Next
- Day/Night

Previous and Next
These soft keys allow you to scroll through and display the various gauge screens.

Video
When enabled, displays either full screen video or partial video within a window on the Gauge display. This video setting is changed on the **User Settings** screen further in this document.

Full Screen Video   **Partial Screen Video**

Day/Night
The feature allows you to toggle the display screen between **Day View** and **Night View**. There are two night view options available (Red and Blue) and a **Backlight Toggle** that turns OFF the backlight in a blackout 'Sleep' Mode. The **Backlight Toggle** function only turns the backlight off. The unit will operate as normal, but with no backlight.

Home
When the **Home** key (upper left) appears on a screen, the soft key can be used to immediately jump to the screen you designate as the **Home** screen. This selection is made in User Settings, Screen Setup (page 15).

Ambient Light adjustments are made from the **User Settings** screen explained in another section of this document.
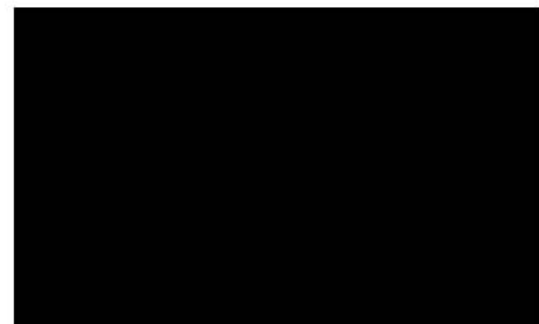
Day View

Night View - Red

Night View - Blue

Backlight Toggle

Engine Diagnostics

Choose **Engine Diagnostics** from the **Menu** for the HelmView 750 to query the Engine Control Unit(s) and provide feedback on any activated service codes.


Faults displayed are based on engine or auxiliary sources.
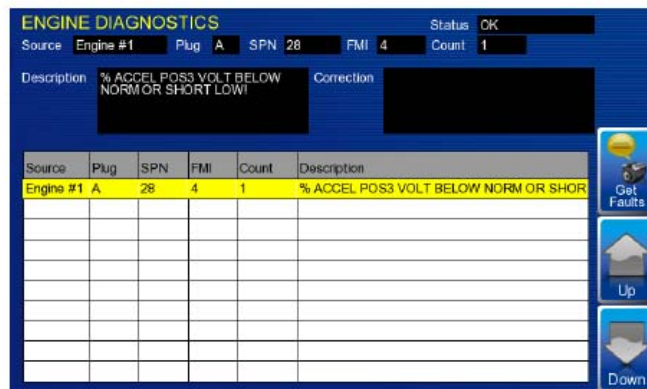
The following is a list of definitions for fields on the **Engine Diagnostics** screen:

- **Status** – indicates if the fault has been corrected.

- **Source** – identifies the component having the fault - port or starboard engine, or auxiliary (for example, transmission).

- **SPN** – (Suspect Parameter Number) an SAE identifier fault code

  If the SPN is not translated into text by the HelmView 750 display, see the engine manufacturer's literature for a definition of the SPN number.

- **FMI** – (Failure Mode Indicator) fault code

  The FMI is defined by SAE J1939. If not translated into text, see the SAE standard, or the engine manufacturer's literature.

- **Count** – The number of times the event has been flagged.

- **Description** – The common SPN's and FMI's have a text description stored in the HelmView 750 display. If there is no text, then define this SPN/FMI by referring to the engine manufacturer's literature, or the SAE J1939 standard.

- **Correction** – Troubleshooting guidelines for corrective action to take in resolving the fault. **This field is only used with specific brands and models of engines.**

Fault Code Pop-ups

A fault condition triggers a pop-up dialog box on the screen describing the nature of the fault. The following screens are examples of warning and shutdown fault code pop-ups.
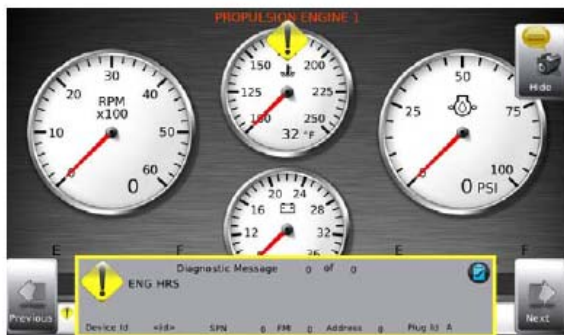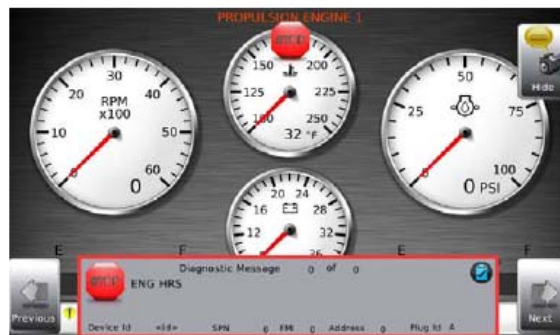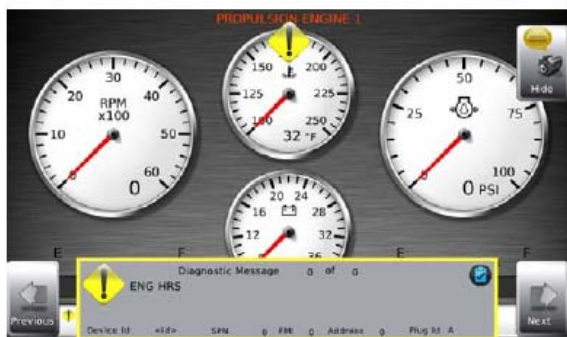
WARNING

SHUTDOWN

How to Hide/Show Faults

To hide the fault code pop-up displayed on the screen, press the soft key on the upper right next to the **Hide** icon. The pop-up disappears, however the **Warning** or **Stop** icon remains on the screen to indicate there is still a fault. Pressing the **Hide** soft key does not clear the fault; it only hides the pop-up message.

When a fault code has been hidden, a **Recall** icon remains on the right side. When this soft key is pressed, the fault code displays again. When a fault message is activated, a pop-up message is displayed until the alarm is acknowledged by pressing the "Hide" key.


Warning showing

Warning hidden, Recall button showing

Scrolling Through Multiple Messages

The title-bar of the fault code pop-up may indicate multiple messages, as in 'Diagnostic Message 1 of 2. Use the **Previous** and **Next** soft keys to scroll through additional messages.

User Settings

User Settings allows you to set viewing preferences for the HelmView 750 Display. Pressing **Up** and **Down** navigates through the options. To change an option, press the corresponding soft key next to the desired soft key command.
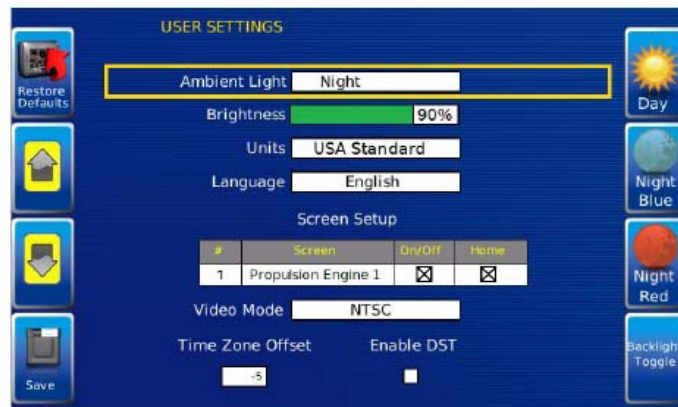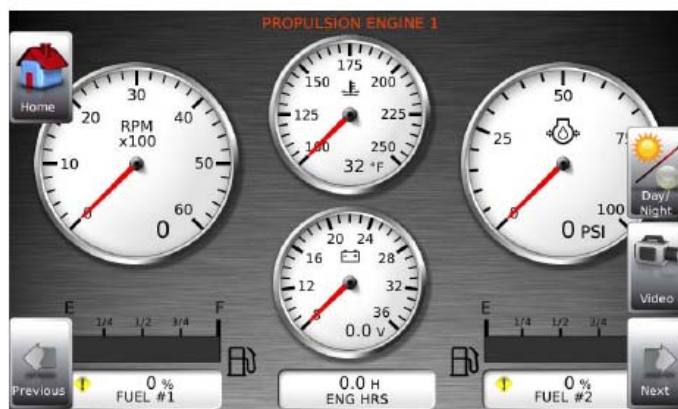

Ambient Light

The ambient light options include one Day, two Night, and a Backlight Toggle. The appearance of these screens is shown on page 9 and 10 of this document.

The **Backlight Toggle** turns the backlight off to 'Sleep' mode. You can reach this from the **User Settings** screen or from any screen if either of the top two soft keys (left and right) are unassigned. Hold the soft key down for 5-seconds to turn OFF the backlight (This function only turns the backlight off. The unit continues to operate as normal, but with no backlight). Press any soft key to 'Wake' the backlight.

In the screen below, you can use the unassigned upper right soft key to access the **Backlight Toggle** mode, and the second soft key down to switch between night and day.

Brightness

You can set the brightness control by using the soft keys to change the settings in +1% and +5% increments until the desired brightness is achieved.
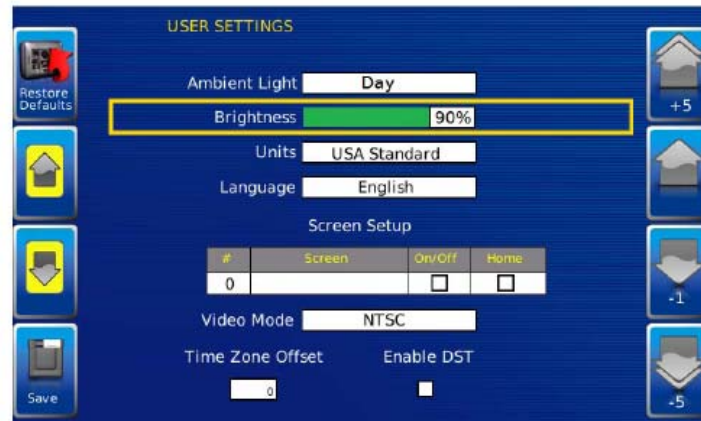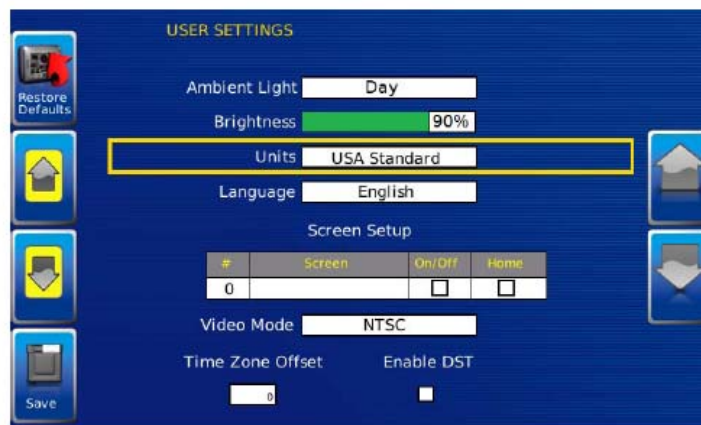

> **NOTE**: Brightness levels will change with ambient light setting. You can save two brightness levels, one for day, and one for night.
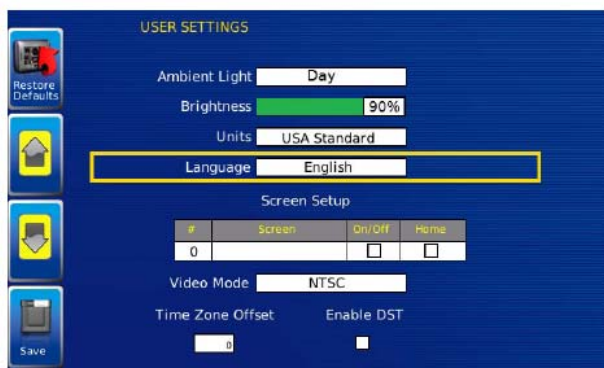
Units

Select how units display by using the soft keys to select from the following:

- USA Standard
- Metric Bar

- Metric kPa
- British Standard

Language

This option allows you to select the language displayed on the HelmView 750. Available languages include English, Spanish, German, Italian, French, Brazilian Portuguese, Russian, Chinese, Japanese, Czech, and Arabic.

Screen Setup

Initially Gauge Screens are listed in default order. You scroll through them using the **Previous** and **Next** soft keys.
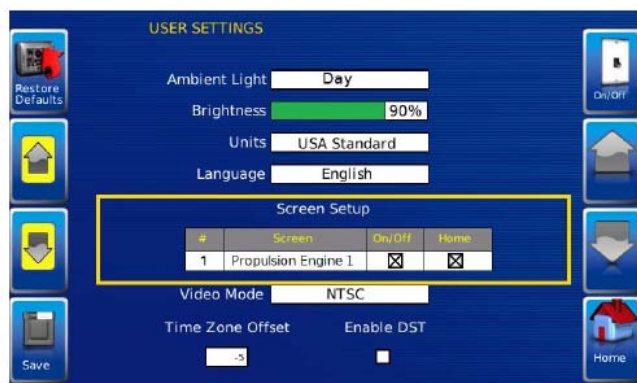

The **Screen Setup** allows you to turn specific screens ON or OFF depending on what you want to monitor. Turn a screen ON by selecting the check box. To turn a screen OFF, click the check box to clear.

To select a **Home** screen to display every time the unit is powered up, select the **Home** check box for only one screen.

Video Mode

Change accordingly to match video input – either NTSC (National Television Standards Committee used primarily in North and South America, or PAL (Phase Alternating Line) used in Europe and Asia. Degradation of picture quality and resolution can occur if the correct Video Mode is not selected.
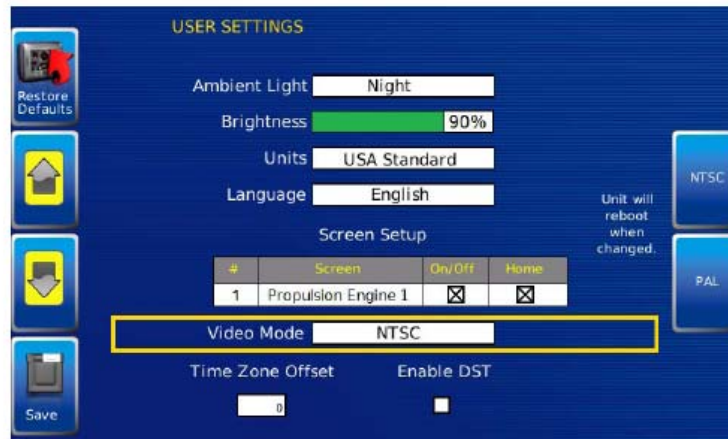
NOTE: The HelmView 750 reboots when you change the video input mode.

Time Zone Offset

Time is provided via GPS signal through your GPS receiver. Most GPS devices convert GPS time to UTC (Coordinated Universal Time). Time Zones are normally offset from UTC by a whole number of hours (UTC−12 to UTC+14).
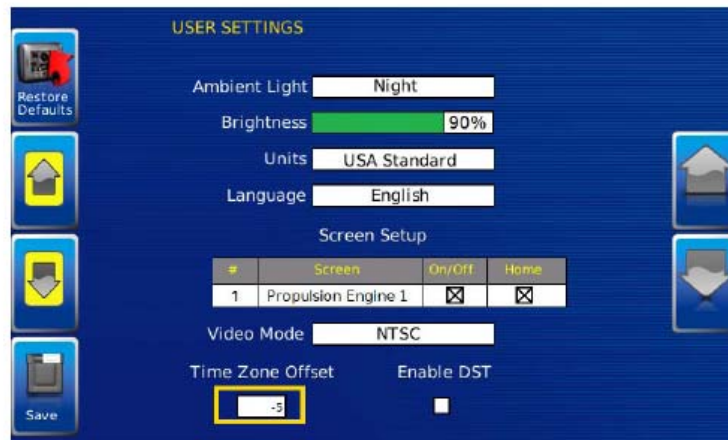
Use the **Up** and **Down** Arrows to scroll to your time offset. The range offered is -12 to +13.

Enable DST

To Enable Daylight Savings Time, press the soft key for DST ON. To turn DST OFF, press the soft key for DST Off.
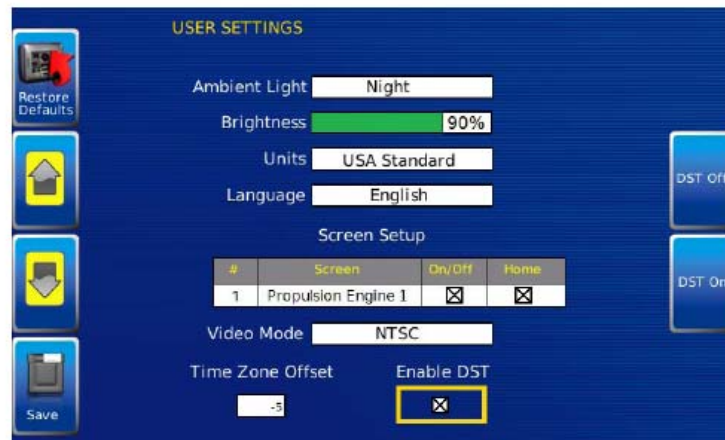
Save

Once all changes have been made, press **Save**. The following confirmation screen is displayed.

Press the **Enter** soft key to **Save**, or press the **Menu** soft key to **Cancel**.

Restore Defaults

Restore Defaults sets all the features of the display to the original factory settings. During troubleshooting, you can use this as a last resort to reset the display to a known state.

To restore the default user settings, press the soft key for **Restore Defaults**. The following confirmation screen displays.

Press the **Enter** soft key to **Restore Defaults** or press the **Menu** soft key to **Cancel** the action.

Utilities

The **Utilities** menu allows you to configure communication settings, setup data logging, and trip parameters.

When you select **System Settings** or **Service Reminders**, you will only see the abbreviated screens you saw when you set up the unit. To see the expanded screens, see **Accessing the Hidden System Settings** Screens on page 21.

Data Logger

Use the Data Logger function to record the J1939 parameters being read by the HelmView 750. The parameters recorded are defaulted to those that display on gauges and screens. The recorded information can be downloaded to a USB device.
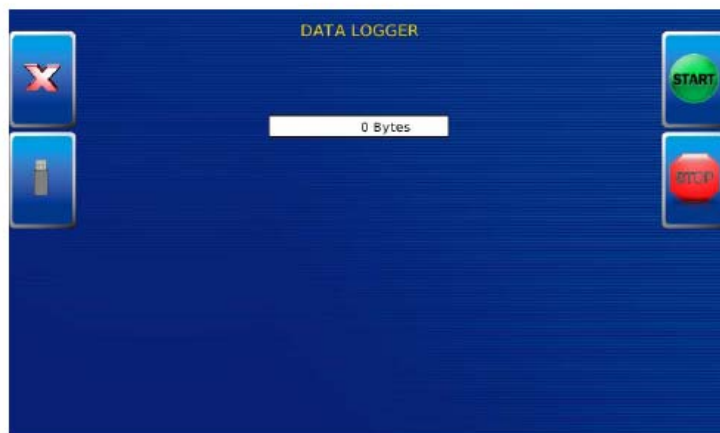
Press the **Start** soft key to begin recording. Press the **Stop** soft key to stop recording. To download the recording to a UBS device, press the soft key for the USB icon (second button down on the left).

Trip Parameters

Trip Parameter calculates or uses J1939 to determine fuel usage.

Press the adjacent soft key to select J1939 and use SPN 182 (Engine Trip Fuel) to display fuel used during all or part of a voyage.

Press the adjacent soft key to select **Calc**. The HelmView 750 will use all engine-trip fuel-data to calculate a fuel usage number.

The **Trip Fuel** gallons/liters display on the GPS gauge screen. To clear a trip, press the soft key adjacent to the **Reset Trip** icon. The following warning displays.
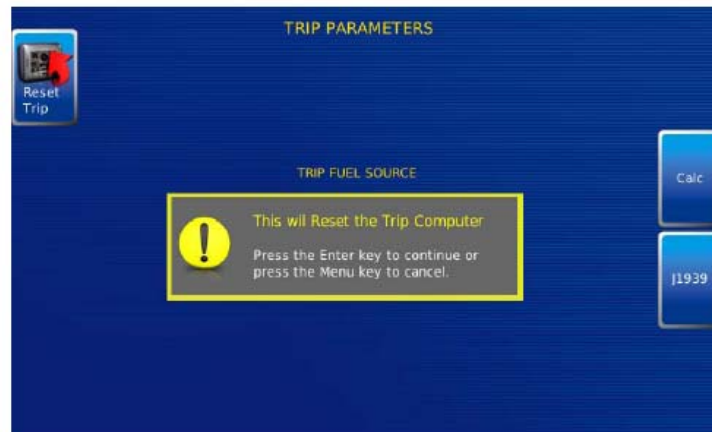
Press the **Enter** key to continue or press the **Menu** key to **Cancel** the action.

Accessing the Hidden Screens

There are three hidden menus:

 System Settings, **Service Reminders**, and **CAN GROUP Settings.** You reach these screens from the **Main Menu**. Instructions on how to use each of these screens is included in this section.


To reach the Hidden Menus,

1. Press the second Soft Key down on the right side, twice.
2. Press the third Soft Key down on the right side, twice.
3. The **Utilities** displays.

4. Use the adjacent soft key to choose from the menu at left.

System Settings screen

The System Settings screen displays the current software version loaded on the HelmView 750 display. You can enter individual settings for the available options and 'Save', or select Restore Defaults to reset to the factory settings.
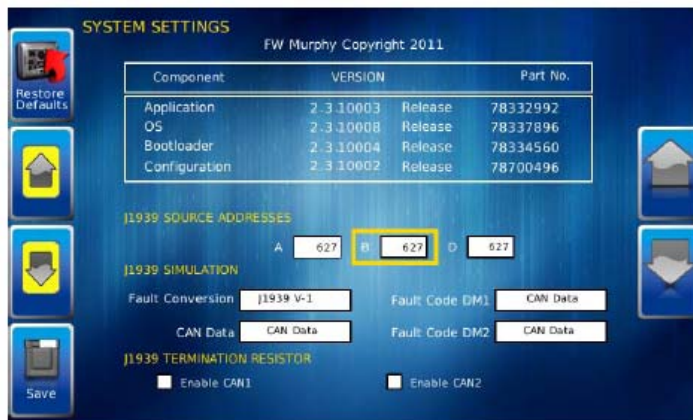
The yellow **Up** and **Down** keys on the left allow you to move the cursor through 'J1939 Source Addresses' fields.

While the cursor is highlighting a field, use the gray **Up** and **Down** keys on the right side to scroll through available options.

Once you have selected all options, press **Save**.

Service Reminders screen

The Service Reminders screen allows you to reset the five built-in service reminders:

Default Intervals:

Change Engine Oil – Default interval 50.0 Hrs.

Chang Air Filters – Default interval 75.0 Hrs.

Change Hydraulic Oil – Default interval 100.0 Hrs.

Service Engine – Default interval 125.0 Hrs.

Service Machine – Default interval 150.0 Hrs.

On the above screen, use the soft keys for the gray **UP** and **DOWN** arrows on the left side to reach a specific **Service Reminder**. You can then use the **OFF** button to change the interval time to zero (0) so the reminder is disabled.

Press the **Edit** soft key to reach the **Service Interval Edit** screen.
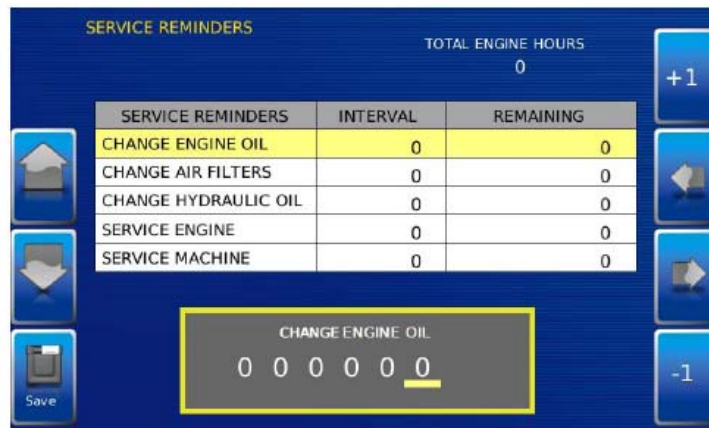
1. To edit the service reminders, use the soft keys for the gray UP and DOWN arrows on the left side to reach the Service Reminder you wish to change.
2. Use the soft keys for the gray arrows on the right side to reach the correct number column.
3. Use the soft keys for the +1/-1 buttons to increment the number.
4. Press the soft key for **Save** to save the changes.

CAN GROUP Settings screen

Initially port and starboard engines are on one plug (Plug A). The CAN GROUP screen allows you to switch the settings so the starboard engine remains on Plug A and the port engine is moved to Plug B. Press the soft key adjacent to the **Plug A and B** button.

| NOTE: Making this change causes the HelmView 750 to reboot.
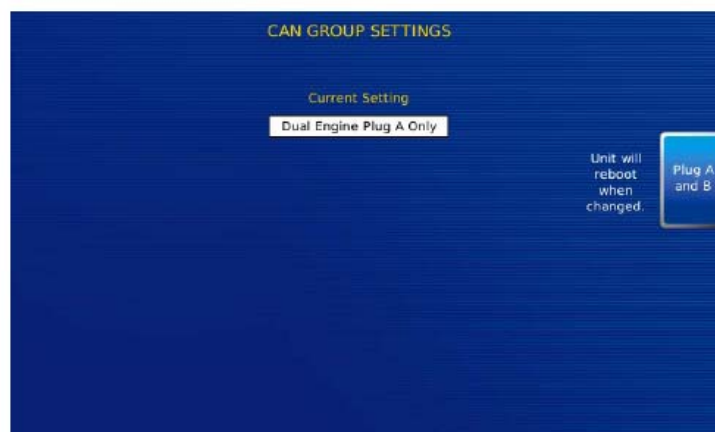
To return to both port and starboard engines on one plug, press the soft key adjacent to the Plug A button. The HelmView 750 reboots, and both the port and starboard engine are on Plug A. See the following graphic.

4. Items list and drawings

4.1 LIST OF ITEMS

4.1.1 <u>Local Panel:</u>

SL NO	PART NO	DESCRIPTION	RANGE	MAKE	QTY
1.	78-70-0436	PV 450	24VDC	MURPHY	1
2.	78-70-0420	XM 500	24VDC	MURPHY	1
3.	79.70.0096	MECAN	24VDC	MURPHY	1
3.	79.70.0097	MECAN	24VDC	MURPHY	1
4.	C60N 24336	MCB	2P 10A	SCHNEIDER	1
5.	IS506101	FUSE HOLDER AND FUSE	6A	SCHRACK	2
6.	4RT78626/PT570024	RELAY	8PIN 24VDV	SCHRACK	4
7.	RM805024	POWER RELAY	24VDC 25A	SCHRACK	1
8.	4PT78704/RT424024	RELAY	14PIN 24VDC	SCHRACK	4
9.	RLFK2420CHG	FSR	24VDC 20A	RING	1
10.	RLFK2420CHG	SMR	24VDC 20A	RING	1
11.	XB7-EVO-BP	INDICATOR LIGHT (RED)	24DC	SCHNEIDER	1
12.	XB7-EVO-BP	INDICATOR LIGHT (GREEN)	24DC	SCHNEIDER	1
13.	ZB5AD2	2 POLE SELECTOR SWITCH	ON-OFF	SCHNEIDER	2
14.	XB5A5542	EMERGENCY PUSH BUTTON WITH GUARD	20A	SCHNEIDER	1
15.	XB5AA45	STOP PUSH BUTTON WITH GUARD (RED)	20A	SCHNEIDER	1
16.	XB5AA35	START PUSH BUTTON (GREEN)	20A	SCHNEIDER	1
17.	XB5AD21	MUTE PUSH BUTTON (BLACK)	20A	SCHNEIDER	1
18.	430/091	BUZZER	24V	ASKARI	1
19.	8315	TOGGLE SWITCH	10A	-	1
20.	CBD10	TERMINAL	50A	CABUR	5
21.	1492-L3T	TERMINAL	20A	ALLEN BRADELY	4
22.	ZB5AD3	TERMINAL	10A	DEGSON	50
23.	NSYCRN54250	ENCLOSURE	500x400x200	SCHNEIDER	1

4.1.2 Engine Mounted Gauge Plate:

SL NO	PART NO	DESCRIPTION	RANGE	MAKE	QTY
22.	20BTG120−1/2	TEMPERATURE GAUGE(OPTIONAL)	0−120°C	MURPHY	1
23.	20BPG100	PRESSURE GAUGE(OPTIONAL)	0−100 PSI	MURPHY	1
24.	20BPG400	PRESSURE GAUGE(OPTIONAL)	0−400 PSI	MURPHY	1
25.	A20DP−30	ENG.OIL DIFF PRESSUREGAUGE(OPTIONAL)	0−30 PSI	MURPHY	1
26.	060−3109	PRESSURE SWITCH KPS31	0−10BAR	DANFOSS	1
27.	060L3130	TEMPERATURE SWITCH KPS80	0−120°C	DANFOSS	1
28.	ES2T 250/300	TEMPERATURE RESISTIVE SENDER	0−120°C	MURPHY	1
29.	ES2P−100	PRESSURE RESISTIVE SENDER	0−100PSI	MURPHY	1
30.	MBT5560	TEMPERATURE TRANSMITTER	0−150°C	DANFOSS	2
31.	MBS3100	PRESSURE TRANSMITTER	0−6 BAR	DANFOSS	2
32.	MBS3100	PRESSURE TRANSMITTER	0−40 BAR	DANFOSS	1
33.	EL150K1	COOLANT LEVEL SWITCH	FULL/LOW	MURPHY	1
34.	MP3298	MPU	FREQUENCY	MURPHY	1
35.	ZB5AD3	TERMINALS	2.5SQ.MM 10A	DEGSON	30
36.	NSYCRN32200	ENCLOSURE	300x200x150mm	SCHNEIDER	1
37.	STEEL	MS PLATE	300x600x3mm	RAJKOT MARINE	1

4.1.3 Remote Panel:

SL NO	PART NO	DESCRIPTION	RANGE	MAKE	QTY
38.	78−70−0525	HV 750	24VDC	MURPHY	1
39.	AES−1411−38	KEY SWITCH	20A	−	1
40.	RS−589−648	INDICATOR LIGHT (GREEN)	24DC	RS	1
41.	XB5AA45	STOP PUSH BUTTON WITH GUARD (RED)	20A	SCHNEIDER	1
42.	249−429	BUZZER	30A 40V	ROHS	1
43.	XB5A5542	EMERGENCY PUSH BUTTON WITH GUARD	20A	SCHNEIDER	1
44.	8315	TOGGLE SWITCH	10A	−	1

4.1.4 AFT Panel:

SL NO	PART NO	DESCRIPTION	RANGE	MAKE	QTY
44.	ATHS 30 12−C	TACHOMETER	0−3000RPM	MURPHY	1
45.	XB5A5542	EMERGENCY PUSH BUTTON WITH GUARD	20A	SCHNEIDER	1

4.2 Drawings